

Minireview:

Highly active antiretroviral therapy (HAART) and testicular morphology: current status and a case for stereological approach.

Qp{ go cgej k'Q0C| w'Rj F ""

F luekr nkpg" qh'Erkplecn'Cpcvqo {." Uej qqri'qh " Ncdqtcvqt { 'O gf lekpg" cpf " O gf lecn'Uekpegu."

Wpkxgtukv{ 'qh'My c\ ww'P cvcn'F wtdcp'6223.'Uqwj 'Ch'lec0"

c| wB wni p0e0 c"

Cduwcev<"

Cu" cpvktgtqxkcn' vj gter { " dgeqo gu" kpetgcukpi n{ " ceegukdrg." vj g"cuuq ekcvgf " ko r tqxgo gpvu" kp" j gcmj ." s wcrkv{ "qh'hkg" c pf " vj g"uwtxkcn' qh'r cvkpw'ctg'cp vlek cvgf " vq" kphwpgpeg'vj g'htvkv{ " f gvgto kpcpv"qh'r cvkpw'ur gekhecm{ "{ qwpi "o crgu'y kj kp"vj g'tgr tqf wevkg'czku0V j gtghqtg"vj g" wpf gtucpf kpi " qh'vgukewrt"j kuvqmi { 'kp'r cvk gpvu" y kj "J KXICF U" wpf gti qkpi " vj gter gwle" o cpci go gpv'ku'guugpvkn"dgecwug"vj g'ugzwentqwg"ku'qpg'qh'vj g'o clp"o gcpu"qh'vcpuo kuukpp"qh" vj g"j wo cp'ko o wpqf ghlekpe{ 'xktwu."y j lej 'ku'mecrk gf 'r tko ctkn{ 'kp"vj g'i gto "egmu'qh'vj g'vgugu0K" ku"cuq"ko r qtcvpv"vq"f gvgto kpg"y j gvy gt"cp{ "ej cpi gu"j cxg"qeewtgf "kp "vj g"vgukewrt"j kuvqmi le" r cvgtpu"kp"vj g"eqwtug"qh'vj g"J KXICF U"vj gter { 0Vj ku'tgxkey "j ki j rki j w'vj g'xkey u'qh'gzr gtw"vj cv" ewtgpv"vj gter { "cpf 'r tqmipi cvkp"qh'uwtxkcn'kp"J KXICF U'r cvkpw'ct g"cuuqekcvgf "y kj "c'uj kh'kp" vj g"j kuvqmi le'hpf kpi u'qh'vgugu"vy ctf "c"o qtg"r tqpqwpegf "quu'qh'i gto "egmu0Cp"cwgo r v'j cu" cuq"dggp"o cf g"vj cv'vj g'r wtr qug"qh'wukpi "uvgtgqmi lecn'uk g"cpf "pwo dgt"guvko cvqtu'ku'vq's wcpvkh{ " vj g" xqno g" qt'pwo dgt" qh'dkqmi lecm{ "u ki pkhlecpv' tghgtgpeg" ur cegu"cpf "qdlgevu'htqo " vj gk" cr r gctcepeg"qp"4/F "ugevkapu'y kj qw'kvtqf wekpi "dku'htqo "kpcr r tqr tlcvg"cuuwo r vkpu."o qf gnu."qt" eqttgevkp"htqo wcu0Vj gtghqtg."o qtr j qmi lecn'ej cpi gu"tgrevgf "vq"cnvgtgf "f kwtkdwkqp"J CCTV" y kj kp" vj g'vguku"cpf "vj g'eqpugs wgpv'gpf qetkpg " r gtwtdevkapu"ej ctcevgtkvke"qh'c'r qvkvkn " eqo r dekcvkp"qh'cpvktgtqxkcn'tgcvo gpv'tgi ko gpu'ecp"dg'cpcn{ | gf "kp"uvgtgqmi lecn'f ko gpukqp0'

Mg{ 'y qtf u"J CCTV."vguku."j kuxqmi { ."ugt gqmi { ."vzlek{ "

INTRODUCTORY COMMENTS

Historical perspectives & epidemiology of HIV/AIDS

Vj g"j wo cp"ko o wpqf ghlekpe{ "xktwu"J KX+"y j lej "ecwugu"ces vkt gf "ko o wpg/f ghlekpe{ "u{ pf tqo g" *CF U+"j cu'dggp"npqy p"qxtg"vj g"rc uv"vj tgg"f gecf gu"cpf "ukp eg"vj gp"o qtg"vj cp"47"o knkqp"r gqr ng" j cxg"f kgf "qh"CF U"cpf "o qtg"vj cp"62"o knkqp"ctg"ewtgpw{ "kphgevgf "d{ "vj g"x ktwu"*Y J Q"(" WPCFU."4226+0Vj g"J KX"r cpf go le"j cu'eqpvkpwgf "v"ej cmgpi g"vj g"fgxgnr o gpv"cpf "geqpqo { " qh"o cp{ "eqwptkgu"y kj "pq"gzegr vkp0K"ku"qpg"qh"vj g"ukpi ng" o quv"ko r qtcvp"j gcnj "kuwgu"vj cv" vj tgcvgp"vj g"uwtxx cn"qh"o knkqpu"kp"uwd/Ucj ctcp"Chlec"*Uwexg"gv'cn{ "4224+0J gp eg."vj ku"j cu" uklo wrcvgf "vgo gpf qwu"i nqdcn'ugctej "hqt"utcvgi k gu"cpf "tgcvo gpv"qr vkpu"v"gpuwtg"vj cv"J KX" kphgevgf "r gtuppu"j cxg"ceeguu"vq "cpvktgtqxktcn"vj gter { 0K"vj g" f gxgnr gf "y qtrf ."o qtvcrk{ "htq o " CF U"j cu"uki pkhecpw{ "tgf weg f ."kp"r ctv'f wg"vq"y kf g"cxckrdkrk{ "cpf "ceeguukdkrk{ "vq"j ki j n{ "cevxg" cpvktgtqxktcn"vj gter { "J CCTV+0K"t guqweg/do kgf "eqwptkgu"j qy gxgt."cnj qwi j "vj gtg"j cu'dggp" uvgcf { "rtqi tguu"kp"lpetgculpi "ceeguukdkrk{ "vq"cpvktgtqxktcn"vj gter { "CTV+."o quv'r cvkpw"j cxg"pq" ceeguu"vq"vj ku"rkg"ucxkpi "kpvgtxgpvkp"*P cvtciu."4228+0Wphqtwpvcgn{ ."vj g'r qqt"cpf "xwpgtcdrg" ugi o gpw"qh"vj g"uqekgv{ "ctg"rkng{ "vq"o ku"qwu"htqo "ceeguulpi "J CCTV"gur gekm{ "y qo gp"cpf " ej kf tgp"ctg"rkng{ "vq"dg'r qqt"cpf "uqekm{ "xwpgtcdrg"*O wwr"gv'cn{ "4229+0"

Htqo "gr kf go kqmi kcn'r qkp'vqh'xkgy ."Uqwj gtp"Chlec"ku "vj g'tgi kqp"qh"vj g'y q trf "vj cv"j cu'dggp" j ctf guv"j k'd{ "vj g"J KX " r cpf go le"y kj "rtgxcngp eg"tcvu"j ki j gt"vj cp"32' 0Rtgxcngpeg"uw txg{ " cetquu"vj g'tgi kqp"uj qy gf "vj cv'O cmry k'tgeqtf gf "3606' "lp"vj g'O cmry k'F g o qi tcr j le"cpf "J gcnj " Uwtxg{ "kp"4226"*P cvkqpcn'Ucvkukcu"QHleg" ("QTE'O cetq."4226+." co dlc"J KX"r tgxcngpeg"*370 6; " { gctu+y cu"3708' "lp"vj g\ co dlc"F g o qi tcr j le" cpf "J gcnj "Uwtxg{ "4222623*\ co dlc" F go qi tcr j le"cpf "J gcnj "Uwtxg{ "4222/4223."4225+."P c o kdk"y cu"32' "37"vq"6; "{ gctu+lp"4227" *O kpkwt{ "qh"J gcnj "cpf "Uqekcn'Ugtxlegu."4227+0Vj g"F go qetcvk"tgr wdrk"qh'Eapi q"*F TE+"j c u"

607' " qh'ku'r qr wncvqp'lphevgf " *F go qetcvle" Tgr wdrlc'qh'E qpi q< P cvkqpcn'O wnc/Ugevtcn'
 Rtqi tco o g'hqt'yj g'Tgur qpug'vq'J KXICF U."4228+"cnj qwi j 'vj ku'hki wtg'ctg'hkngn{ "vq'dg'vptgrkcdrg"
 cu'j gcmj 'lphtcutwewt'g'lp'yj g"eqwpt{ "qwuuf g'yj g" ecr kcn'ekv{ 'ku'cm quv'pqp/gzkugpv'f wg'vq"
 ugxgtcn'{ gctu'qh'ekxkly ct0'kp'yj g'Wpkgf "U wvgu."k'ku'gunko cvgf "vj cv'yj gtg'ctg": 72.222/; 72.222"
 rgtuqpu'rkxkpi 'y kj "J KX"RNY J Cu+"cpf "vj cv'yj g'lpkf gpv'tcvg'kp etgcugu"geej "{ gct0'Ukpeg'CF U"
 chhgew'uq'o cp{ 'r gqr ng'qh'y qtnkpi 'ci g'lp'yj g'WU."kuwgu'qh'go r m{ o gpv'y qtnltgj cdkkcvkqp"cpf "
 CF U'lp'yj g'y qtnr nceg'j cxg'cmldgeqo g'o clqt'eqpegtpu"*Dtcxgo cp'gv'cn0"4228+0"

Antiretroviral drug therapy (ART)

Ewtgtp'J KX'r tngxpvpqp'utcvg i kgu'lpemf gu'eqo r tgj gpukxg'r qr wncvqp"lpvgtxgpvpqpur'tqo qvki "
 eqpf qo "wug." gctn{ 'f kci pquku" cpf " vtgcvo gpv' qh'ugzwcn{ 'tcpuo kwgf " f kugcugu" cpf " gf wecvkqp"
 r tqi tco u" vj cv'f getgcug'tcvg'qh'ugzwcn'r ctvpgt" ej cpi g" cpf "qvj gt'j ki j /tkum'ugzwcn'dgj cxkqwt"
 *Ogtuqp".3; ; 5=Eaj gp'gv'cn0"3; ; 6=I tqumwtvj "gv'cn0"3; ; 7= Uwo ctvqlq" gv'cn0"3; ; 9+co qpi "
 qvj gtuo' Cpvtgtqxkcn'f twi u"*CTXF u+"ctg'f twi u " wugf 'hqt'yj g'vtgcvo gpv' qh'lphevgqp'd{ "
 tgtqxktwugu'r tko ctkn{ "J KX0'Vj g{ "ctg"qh'f khtgpv'encuugu'cpf "cnq" cev'cv'f khtgpv'uci gu'lp'yj g"
 r tqi tguakqp"qh'J KX'lphevgqp"*Y J Q."4225+0Vj g'eqo dlpcvqp"qh'CTXF u'ku'hpqy p"cu'J ki j n{ "
 Cevkxg"Cpvtgtqxkcn'Vj gter { "*J CCTV+"Mqxceu'gv'cn0"3; ; ; +0Vj gter gwle"qr vqp'uuctvgf 'y kj "
 pwengquf g"cpcmj wgu'tgxgtug'tcpue tkr wug'lpj kdkqtu"*P TVK u+weej "cu'rco kxw'kpg'cu'y gm'cu'yj g"
 r tqvgcug'lpj kdkqtu"*RK u+y j lej "gpj cpegf "vj g'uwtx kcn'qh'r cvkpwu0J qy gxgt."eqpxgpvpqpcn'cpv/
 tgtqxkcn' yj gter kgu'f q'pqv'eqo r ngvgn{ "gtcf lecvg"J KX'htqo " vj g" dqf { ."cpf 'enkplecn'v'kcn'ctg"
 tgr qtvpki "vj cv'ewtgpv'xcekpg'utcvgi kgu'ctg'pqv'eqo r ngvgn{ "ghhgewkxg"*Ucci "cpf "Mkd{ ".3; ; ; +0""
 Y kj "vj g'cf xgpv'qh'CTV."qxgtcm'r tqi pquku'j cxg "ko r tqxgf "f tco cvkcm{ "*Cwvgtv'gv'cn0"4226+ "
 y kj "uki phhecpv'ko r cev'lp'yj g'o cpci go gpv'qh'J KX'lphevgqp."uwr r tguakqp"qh'xkcn'tgr ncevqp"cpf "
 tgf wekpi "vj g'o qtdkf k{ "cpf "o qtvrk{ "cuuqekcvgf "y kj "CF U"j cu'f ko lpkuj gf "cpf "o cp{ "r gqr ng"
 chhgewf "d{ "vj g'xktwu'ctg'pqy "rkx kpi "y kj "c"o cpci gcdrg"ej tqple"eqpf kxqp"*Xcp"Uki j go "gv'cn0"

4225="Mc{ qf g'gv'cn0"4233."Mwuj pk"cpf "Ngy ku." 4233+0J CCTV"j cu'f g o qputcvgf "tgo ctnrdng"
uweegu"lp'tgf welpi "y g'qxgtcmj gcnj "ectg"equv u"lqt "J KX/r quksx g'r gtuppu"*O qetqlh'gv'cn0"4225="Etwo "gv'cn0"4228+0Vj g'uweegu"qh'ewttgpv'tgi ko gp"j cu'tcpuhqto gf "J KX"lphgevkp"lpvq"e"ej tqple"
eqpf kkp"tgs wtkpi "o cpci go gpv'qxgt"y g'eqwtug"qh"{ gctu"cpf "f gecf gu0"

Cv'r tguvpv."cpvktgtqxktcn'y gter {"cxckrd ng"lqt"enplecn'r tcevek"eqpuku"qh'f twi u'ltqo " y tgg"
emcuugu."vti gvpi "y q'f lhtgpv'xktcn'r tqvgk pu<"y g'pwengqukf g"cpmji wg/"cpf "pqp/pwengqukf g"TV"
kpj kdkqtu"*P TVK"cpf "P P TVK."tgur gevkg" + "cpf "y g'r tqvcug"kpj kdkqtu"*RK+0E wttgpv'tgcvo gpv"
tgi ko gpu" ci clpuv"J KX/3"lpenwf g'pwengqukf g'tg xgtug" tcpuetr vcug" kpj kdkqtu" *P TVK+"lp"
eqo dlpckvp"y kj "r tqvcug"kpj kdkqtu"*RK+"cpf "lqt"pqp/pwengqukf g'tgxgtug"tcpuetr vcug"kpj kdkqtu"
*P P TVK+."hwkqp"cpf "E ET7"eqtgegr vqt "kpj kdkqtu"cpf "lpvgi tcug" kpj kdkqtu"ctg"y g"o quv'tgegpv"
cf f kkpqu"vq"y g'ur gevwo "qh'cxckrdng"ci gpw"*Guvg"cpf "Ekj nct."4232+0P TVK"lpenwf g" kf qxwf kpg."
ucxwf kpg."no kwf kpg"cpf "cdcecxk"co qpi uv'qy gtu0P P TVK"lpenwf g"ghcxktgp|. "pgxkcr kpg"y j kg"
tkqpexk."lpf kpcxk."ucs wpcxk."cvc| cpcxk"ct g"cm"RK"i kuup"cpf "J ci dgti ."4223="O cuwcp"cpf "
Mwo ct."4232="Mc{ qf g'gv'cn0"4233+" *cdng"3+0Y j kg"P P TVK."uwej "cu'pgxkcr kpg."j cxg"dggp"
uj qy p"vq"dg"uwr gtlqt"cngtpcvkgu "vq"r tqvcug"kpj kdkqtu"*RK+. "qy lpi "vq"y g'ugt kqu"o gvcdqle"
eqo r nlecwkpqu"ecwugf "d{ "RK"lp"J KX/lphgevgf "r c vgpw"cpf "j cu'd geqo g"y g"htuv/rkpg"y gter kgu"
*J cttki"cpf "O qpvcpgt."4222="Ucci " gv'cn0"4224+."y g{"j qy gxgt"j cxg "dggp"cuuqekcvgf "y kj "gctn{ "
cf xgtug"ghgevu"*Y k'gv'cn0"4224+0Vq"uweegu"hw"o cpci g'r gqr ng"y kj "J KX."k'ku"etwelcn'vq"lhp"c"
dcnpeg"dgw ggp"CTXF"r qvge{." vqgtcdkkl{."uchgv{."cpf "eqpxgpkgep"y j kg"r tqx kf lpi "f wtcdng"
xktcn'uwr r tguukp"*Miguu."4226+0"

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Toxicities of HAART

Vj g"dgpghku"qh'y gug"cpvktgtq xktcn'f twi u'j cxg"dggp"eqo r tqo kugf "d{ "pwo gtqwu"ukf g"ghgevu."
cf xgtug"enplecn'gxgpw"cpf "vzkekkgu0Cm'cpvktgtqxktcn'f twi u'j cxg"dqy "uj qt v/gto "cpf "npi /vgo "
cf xgtug"eqpugs wpegu"dw"y g'tkun'xctkgu"ltqo "f twi "vq"f twi "cpf "ltqo "r cvkpv"vq"r cvkpv0Uqo g"qh"

vj gug"enplecn'cf xgtug"ghgevu" kpenwf g"CKF U/tgrvvgf 'lpuwkp'tg ukwcepg."nr qf { utqr j { 'u{ pf tqo g." i cutqkpvgnkpcn' u{ o r vqo u" cpf 'j { r gti n{ eg o k" *Uej co dgrcp" gv'cn0"4224=Cpqp{ o qwu."4225= O qpvguutk'gv'cn0"4226+0Vj g'o quv'eqo o qp"cpf 'tqwdrguqo g'vzlekkgu'qh'P TVK'cpf 'P P TVK'ku" j gr cvqvzlek{ " *Cdtguelc"gv'cn 0"4227=Uqtkcpq"gv'cn0"422: +y j k j "o c{ "dg'f wg'v'f co ci g'qh" o kqej qpf tk"gur gekm{ 'kp'r cvkpvu'tgcvgf 'y kj " | kf qxwf kpg."ucxwf kpg"qt'f kf cpqulpg"Xgtweej k'gv' cn'4226=Y cmgt"gv'cn0"4226+."cpcgo k" cpf 'pgwtqr gpk" *Hkuej g'gv'cn0"3; ; 2+0F wg'v'v'j gk" eqo r gvkkxg"o qf g'qh'lpj kdkkqp"cpf 'tgs vktgo gpv'hqt"o gvcdqke"cevkxcvkp."cm quv'cm'P TVK'f twi u" ncn'v'j g'xktqmi kecn'r qvge{ 'qh' P P TVK'qt'RK'f twi u0Vj ku'ku'hw t'v'j gt"uwr r qtvgf'd{ "enplecn'f cxc" uj qy kpi "v'j cv'uwxkpgf 'xktcn'uwr r tguakp"ecppqv'dg"cej lxxgf 'y kj "P TVK'."P P TVK'."qt'RK'cmppg0' Vj gtghqtg."v'j g'P TVK'."cpf "cm'qy j gt"eqemckn'qh'J CCTV'y knitgo ckp"guugpvkn'eqo r qpvpv'hqt"v'j g" o cpci go gpv'qh'J KXICF U'hqt"v'j g'hqtguggcdng'hwwt g"*Uj cto c."4233+0' Dgecwug"J KX'ku'o quv'r tgcrgpv'co qpi "r gtuqpu'qh'tgr tqf wekxg'ci g"cpf "cdqw'qpg'v'j kf "qh'y j q" y qwf "f guktg'v'j" cxg'ej kf tgp."tgr tqf wekxg'f guk tgu"j cxg'go gti gf "cu'e nplecm{ "ko r qtvcpv'kp" r cvkpvu'y kj "J KXICF U"*Mwuj pk"cpf "Ngy ku."4233+0' Vj gtghqtg."v'j g'ukf g'g'hgevu'qh'cpv'gtqxkcn' f twi u"qp'hgtvkv{ "gur gekm{ " kp"ci t'qy kpi "r qr wcvkqp"dgeqo gu"cu'ki pkkcpv'ecwug'hqt"eqpegtp0' Vj g"dkqmi kecn'cng tcvkpu"kp'tgr tqf wekxg'r j { ukqmi { "j cxg" dggp"pqvgf "v'j dg "tgur qpukdng'hqt " uwdhgtvkv{ "kp'hgo cngu"lphgevgf "y kj "J KX/3"*Mwuj pk"cpf "Ngy ku."4233+0C" f kgevu'ghgevu'qh'J KX" ngcf kpi "v'j i qpcf cn'hkwt g'j cu'cuq"dggp'r tqr qu gf "kp'dqv' "ugz gu'dw'y kj "r qqt"gnwelf cvkqp" *O j cy gej "gv'cn0"4223=Eglvkv "gv'cn0"4228+0"Vj ku'tgxkgy "ku'v'j gtghqtg'vpf gtvcmgp"v'j j ki j v' vgnkewrt"j kuqmi kecn'ej cpi gu'kp"v'j g'gtc'qh'J CCTV"cpf "J KX"tgcvo gpv'y kj kp"v'j g'eqpvz'v'qh'v'j g" vgnku"cu'cp'ko o vpg/r tg xkrgi gf "ukg"cpf ""cf xqecv'ht"v'j g'wug" qh'uvgtgqmi kecn'cr r tqcej gu"v'j cuuguu'vgnkewrt"o qtr j qmi { "cpf 'hwpvkv'hqmy kpi "cpv'gtqxkcn'tgcvo gpv0"

TESTICULAR STRUCTURE IN ANTIRETROVIRAL THERAPY

Vj g"vguku"rnc{u'c'uki phkecpvtqng'lp'yj g'r tq eguu"qh'tgr tqf wevkqp"d{ 'ku'wpls wpgguu'lp'ut wewt g." nqecvkqp" cpf 'hwpevkqp0Gperuugf 'lp'c'yj tgg/rc {gtgf "ecr uwrg"*qh'wpl ec+"*Dtqqmu."4229+.'k'ku' eqo rcew{ "uwthgf 'y kj 'ugo kphgtqwu"wdwgu'yj cv'o cng"wr 'hqt'82/; 7' "qh'yj g'52'o N'xqno g"qh" vgukewrt"xqno g'yj cv'tgr tgugpw'yj g'ukg'hqt" ur gto cvqi gpguku"*Uj ctr g."3; : 8="Upqy /Nku{ 'gv'cn0" 4233+*"hi wtg"3+0"Tgegpw{ ." yj g'cuuq ekvkqp"dgwy ggp"J CCTV"cpf 'ugzwcnf{ 'hwpevkqp'lp'J KX/ kphgevgf 'r cvkpwu'j cu'dgeqo g'c'uwldgev'qhl'pvgpug'tgugctej 'd{ "gZR gtW0Y j gyj gt 'y ku'f { 'hwpevkqp'ku' tgrcvgf "vq"J CCTV'lpf wegf 'j {r q/i qpcf ku "qt'vq" qvj gt "hcevtu'ku'pqv'engct."j qy gXgt0Vj g" j {r qvj guku"yj cv'J KX'kugrh" ku'cuuqekcvgf 'y kj 'f genkpg"lp'hgtvknk{ "j cu'dggp'r quwrcvgf 'd{ "uqo g " cwj qtu"*Mkf c'gv'cn0"4228+"dw" yj g'r tqqh'hqt'yj ku'tgo ckpu'gnukxg"*O j cy gej 'gv'cn0"4223="Eglvkp" gv'cn0"4228+0Vj g'r cvj qi gpgvke'o gej cpkuo "qh'yj g'ugzwcnf{ 'hwpevkqp'lp'cpvktgtqxktcnf twi /tgcvgf " r cvkpwu'ku'pqv'engct0Dw.'k'uj qwf "dg"eqpukf gt gf "yj cv'yj g'eqo r ngz'tg i ko gpu"qh'J CCTV'o ki j v" j cxg"cf xgtug"ghgevu"qp'yj g's wcnk{ "qh'nhg"*O ctv'pgl 'gv'cn0"3 ; ; ; ="Eqmc| qu'gv'cn0"42 24+"cu'o quv" cpvktgtqxktcnf twi u'uj qy 'i qqf 'r gpgvcvkqp'lp'yj g" o cng"i gpkcn'tcev'cpf " o c{ "yj gtghqtg"chgevu" ur gto cvqi gpguku"*Nqy g'gv'cn0"4226+0Vj g'r quukdn g"ghgevu'qh'J CCTV"qp'ugo gp's wcnk{ 'ku'qh" kpvgtguv'dgecwug"ugo gp's wcnk{ 'ku'c'ng{ 'hcevt'hqt'tgr tqf wevkx g'uweegu"*J wpcwn'gv'cn0"4226="xcp" fgt"Uvggi 'gv'cn0"4229+0Dgecwug"qh'yj g'tgrcvkxgn{ "j ki j "ghhekppe{ "qh'o cng"ugzwcn'tcpuo kuukqp"qh" J KX."cwgpvkqp"j cu'hqewugf "qp'yj g'j kuvqmi ke'hkpf kpi u'qh'yj g'vguku0"

Cu" y kj 'tcf kqyj g tcr { ." yj g'ugo kphgtqwu" gr kj grko " qh'yj g'vgug u" ku" yj g'o quv' ugpukxg"vq" ej go qvj gtr gwke"ci gpwu."cpf 'chgt'r cvkpwu'tg egkxg"i qpcf qvzke"ftwi u."yj g{ "o ki j v'dg'tgpf gtgf " qiki qur gto ke"qt'c| qqur gto ke"*J co kuj "gv'cn0"4227+0"J kuvr cvj qmi kecn'ej cpi gu'lp'yj g'vgugu'qh" r cvkpwu" f { kpi "qh'CKF U'ctg'hgs wgpvy kj 'eq o o qp" hkp kpi u'cv'cwqr u{ 'lpenf kpi 'f getgcugf " ur gto cvqi gpguku."yj kengpgf "dcugo gp'v'o go dtepg."cpf "cp'kpvgtukkn'kphkncvg"*Y grej "gv'cn0"3; : 6=" Fc"Ukxc"gv'cn0"3; ; 2="J cteqwtvF cnqp"cpf "J cteqwtvY gduvgt."3; ; 3="Rwpg{ 'cpf 'Cpf gtuqp." 3; ; 3+0"O wnkx ng'cwqr u{ "uwf lgu'qh'CKF U'r cvkpwu'tgr qtvgf "vgukeywrt"j kuvqmi ke"cdpqto cnkxgu'lp"

o qtg" yj cp"; 7" "qh'ecugu."eqpukwki 'rtgf qo lpcpwn "qh" {r qur gto cvqi gpguku" cpf "vgukewrt" cxtqrj { "F c"Ukxc"gv'cn0"3; ; 2+0J qy g xgt."yj g'r cvj qi gpguku"qh"yj g"j kuvnqi kecn'cnegt cvkpu"uggp"lp" CKF U"cpf "yj g'r quukdng"eqpugs wpegu"qh"ft gcv'lphevkqp"qh"vgukewrt"egm'y kj "yj g"J KX'xktwu'ctg" wnpqy p0'Cmj qwi j "yj g'hwpevkqpcn'uki pkkcepeg"qh"yj g"j k uvnqi kecn'ej cpi gu'lp"yj g'vgugu'ku'pqv" erget."u{o r vqo cvk"j {r qi qpcf kuo "ku'pqv'wpego o qp"co qpi "J KX"lphevgf "o gp"dgctkpi "lp"o kpf" yj cv'uqo g"ftwi u'wugf "lp"yj g'tgcvo gpv'qh'CKF U"ecp"chgevi qpcf cn'hwpevkqp"hgcf kpi "vq'my gt" vguqvgtqpg" rxxgnu."qiki qur g to kc." c| qqur gto kc." cpf "i {pgeqo cvk" *Ugm g{gt" cpf "I twphgf." 3; ; 8+0Y j kg"ewttgpn'uwf { "kf gpv'kku" c"tgp f "lp" i gto "egm'quu'ej ctcevgtk| gf "lp"yj g"gzvgo g"d{ " Ugtvirk'egm'qpn{ "vgukewrt"j kuvnqi ke"hgcvwtgu."yj g'tgcuqp'hqt"yj ku"o c{ "pqv'dg'wpeqppgevgf "vq"yj g" pgy " r j cto ceqvj gtr gwke"cf x cpegu" dgkpi " wugf " vq" vgc v' dqvj "yj g" tgvtxktwu" cpf " ur gekkhe" qrr qtwpkuke"lphevkqpu"lp'CKF U"r cvkpw"Ngkdqxkej "cpf "I qrf y cuugt."3; ; 6+0Vj g'wug"qh"yj gug" r j cto ceqvqi ke"ci gpw'o c{ "r ctwn{ "gzr mlp"yj g'tgp f "vqy ctf "cf xcpekpi "i gto "egm'quu0

The blood-testis barrier (BTB)

Vj g"DVD"ku"qpqg"qh"yj g"ki j vguv" drqqf /vkuwg"dcttktu"npqy p"vq"gz kuv'lp"o co o crkcp"vkuwgu'y kj " gr kj grkcn'qtki kp0Wprkng"qvj gt"drqqf /vkuwg"dcttktu."uwej "cu"yj g"drqqf odtckp"cpf "yj g"drqqf otgvkpc" dcttktu"y j lej "eqpukwwg"cn0 quv'gzenvukxgn{ "ki j v'lwpevkqpu"VLu+"dgvy ggp"gp f qvj grkcn'egm."yj g" DVD"ku"eqpukwwgf "qh"eqgzkukpi "ur gekrk gf "lwpevkqpu"dgvy ggp"Ugtvirk'egm'pgct"yj g'dcugo gpv" o go dtcpg." y j lej "lpenwf g"VLu."dcucn'gevqr mco le"ur gekrk cvkpu" *dcucn' GUu+."i cr "lwpevkqp u" *I Lu+."cpf "f guo quqo g/rkng"lwpevkqpu"Y qpi "cpf "Ej gpi ."4227=Ej gpi "cpf "O twm"422; =Ej gpi "gv' cn0" 4232=Uw'gv'cn0"4233+"ki wt g" 3+0Cf f kkkpccm{ ."yj g"DVD"cp cvqo kecm{ " ugi tgi cvgu"yj g" ugo kpkgtqwu"gr kj grkwo "lpvq'dcucn'c pf "cr kecn'qt"cf nwo kpcn+eqo r ctvo gpw."uq"yj cv'r quv'o gkqvke" ur gto cvk" f gxgnr o gpv" *Q0ur gto kqi gpguku+ cpf " ur gto kvkqp" vcnng" r nceg" kp" c"ur ge kcrk gf " o letqgpxktqpo gpv'dgj kpf "yj g"DVD0Vj g"DVD"et gcvgu"cp"ko o wpqnqi kecn'dcttktg."uq"yj cv'cpki gpu." o cp{ "qh'y j lej "cr r gct"vcpukgpwn{ "f wt kpi "ur gto kqi gpguku."ctg"ugs wguvgtgf "Itqo " yj g'u{ uvg o le"

ekewrckp" vq"cxqkf"vj g'r tqf wevk p" qh'cpvk/ur gto " cpvkdqf lgu0Kp " hcev." vj ku'wn stcutwewtg" f gygto kpgu"kp'rti g'r ctv'vj g'pwtkgpu."kpu."gn gevtn{vgu."cu"y gmi'cu"j q to qpcn"r ctctekpg."cpf" cwqetkpg"hevqtu"j cxkpi "ceegu"vq"vj g'f gxgnr kpi "ur gto cvkf u"kp"vj g'cr lecn'eqo r ctwo gpv"Uw."gv" cn0"4233+0Hwtj gto qtg."vj g'DVD"eqphgtu'egmnr q mtkv{ "Y qpi "cpf"Ej gpi ."422; +tguwnkpi "kp"vj g" pwengkqh'Ugtvqr'egmi'dgkpi "hcecvgf"pgct"vj g'dcugo gpv'o go dtcpg0"

J qy gxgt."tgegpv'uwwf lgu"j cxg"f go qputcvgf"vj cv"vj g'DVD"ku"j ki j n{ "f {pco le"wnstcutwewtg." wpf gti qkpi "gzvgpukg'tgutwewtkpi "vj gtgd{ "hcekkcvkpi "vj g'tcpuk"qh'r tgnr vqvgpg"ur gto cvqe{vgu" cetqu"vj g'DVD"Yj gpi "cpf"O twm"4232=O twm"cpf"Ej gpi ."4232+0Kp"vj g'o kf uv'qh'vj ku'f {pco ku0." vj g"vguvgu"uwnitgo ckpu"ct'gugtxq kt"qh"J KX/kp hgevkv"gxgp"chgt"J CCTV"Fcj n'gv'cn0"4232+" cnj qwi j "uqo g"cwj qtu'dcugf "qp'erplecn'uwwf lgu"j c xg"uwi i guvgf"vj cv'qpg'r qvgpvkn'eqpvkdwkpi " hcevt"vq"vj g'hqto cvkqp"qh'c"J KX"xkcn'tgugtxqkt"kp"vguvgu"ku"vj g"ny "eqpegpvcvkqp"qh'cpvktgtqxkcn" f twi u"tgcej kpi "vj g'ugo kpcn'hwkf"kp"J KX/kphgevgf" o gp"*xcp"Rtcci "gv'cn0"4223=Rgtgkc."gv'cn0" 4224=I j qup"gv'cn0"4226=Etwekpk'gv'cn0"4228=xcp"Nggwy gp"gv'cn0"4229+0J qy "vj ku"j cr r gpu'uwni" tgo ckpu" c"uwlge v' hqt" hwtj gt" kpxguki cvkqp" dw'vj g'tq ng" qh" vj g'gh nwz" u{ uvgu u'y kj kp"vj g" ctej kgewtg"qh'vj g'DVD"ecppqv'dg "twrgf "qwu'cu'r tgxkqun{ "ucvg f 0Ci ckp."vj ku'hcevt"j cu'dtqwi j v" cdqw"vj g'kuwg"qh'f twi "tgukncpeg"cu"y gmi'cu"f gxgnr o gpv'qh'tgukncpeg"utckpu"qh"J KX"kp'r cvkpgu0" Uekpvku"j cxg"cf xqecvgf"vj cv'c"rkng{ "ecwug" qh"ketgcugf "tgukncpeg"o c{ "dg"fwg"vq"vj g"ny " eqpegpvcvkpu"qh"J CCTV"ftwi u"kp"vj g'ugo gp"cpf"ugo kpkgtqu"wdwrgu"cu"c"eqpugs wgepg"qh'vj g" o gej cpkuke"qr gtcvkpu"qh'vj g'DVD0K'ku"o { "qr kpkp."cnq"uj ctgf "d{ "I j qup"gv'cn0"4226+."vj cv'vj ku" ko r gto gcdng"dcctlgt"vq"o cp{ "J CCTV"ftwi u'rkng"ghwxk kf g"cpf"RKu"o c{ "eqpukwng"cj cnngpi g" vq'cej kxkpi "qr vko cn"J CCTV"ftwi "eqpegpvcvkqp"y kj kp"vj g'ugo kpkgtqu"wdwrgu"cu"ky gtg0"

Antiretroviral drugs and spermatogenesis

Ur gto cvqi gpguku"ku"vj g'qtf gtgf"o cwtcvkqp"qh'ur gto cvqi qpk"lpvq'hvpevkpcn'ur gto cvq| qc"cpf" wngu"cdqw'94"fc{ u"vq'eqo r ngv"Uj ctr g."3; : 8+0Vj ku'eqo r ngz"r tqegu"tgs wktgu"vj g"gzvgpukg"

tgutwewtlpi "kp"vj g"Ugtvqrk'egmu"vj cv'tg"vj g" ej cr gtqpgu"qh"ur gto cvqi gpguku"cpf "hqt" "vj g"dmqf /
 vgu"ku"dcttktg"j gpeg"ctg'tcvkqpcn'vcti gw'hqt" f twi ulqzkecpw" *Upqy /Nku{ "gv'cr0"4233+"*hi wtg"3+0'
 Ur gto "o qtr j qmji { "ku'tgi ctf gf "cu'c'uki p hkecpv'r tqi pqu vke" hcevqt'hqt'hgt vkrk' cvkqp"cpf "r tgi pcpe { =
 j gpeg" cdpqto cn'ur gto "o qtr j qmji { "ku'qpg"qh"vj g" o quv" eqo o qp'hc evqtu" qh" o cmg" kphgtvkrk' { "
 *Hcpngp."3; ; : +0Dqj "vj g"NJ "cpf "HUJ "ctg'pgeguuct { "hqt"ur gto cvqi gpguku0J qto qpcn'tgi wrvkvqp"
 qh" ur gto cvqi gpguku" cpf "vgukewrt"cpft qi gp" r tqf wekvqp'kpxqrxgu" vj g" j { r qvj cmo wu."
 cf gpqj { r qr j { uku"*cpvgtkqt'r kwkct { +cpf "vj g"vgugu0' Vgukewrt"tgi wrvkvqp'kpxqrxgu"vj tgg'ugw"qh"
 j qto qpgu<I pTJ /i qpcf qvtqr kp'tgrgcupi "j qto qpg"htqo "vj g"j { r qvj cmo wu'y j kej "uko wrvgu"vj g"
 r kwkct { " vq" r tqf weg'i qpcf qvtqr kpu." HUJ /hqmeng'u vko wrvupi " j qto qpg" cpf "NJ /nwgkpkupi "
 j qto qpg0' I qpcf qvtqr kpu'f kgevn' "uko wrvgu" vj g" vgugu" cpf " vgukewrt" j qto qpgu" y j kej "gzgt v"
 pgi cvkxg" hggf dcmleqp vtqr0'Vj g'hggf dcm'kpj kdkkqp"qp"vj g"j { r qvj cmo wu'cpf "r kwkct { 'tguwmu"
 htqo "vj g"tkulpi "ngxnu"qh'vguquvgtqpg"cpf "kpj kdlp'tgur gevkg'gn' "hi wtg"4+0'

Vgukewrt"o qtr j qmji kcn'lej cpi gu'ctg'cnuq'eqpukf gtgf "vq'dg"c'r qvgpvkn "vcti gv'hqt"J CCTV"cu "
 gnvelf cvgf "d { "Dctdq| c"gv'cr0*4226+"y j gtg"vj g { "cmwf gf "vj cvJ CCTV"tcvj gt"vj cp"J KX/3"xk wu'y cu"
 tgur qpukdrg'hqt"vj g"vqr qi tcr j le'ej cpi gu"lp"ur gto "egmu0J qy gxgt." r tgxkqu"y qtmu'd { "Rqrkej "gv"
 cr0*3; ; 6+"ucvfg "pq'cf xgtug"ghgevu"qh"J CCTV"qp"ur gto "egmu0T gegpv'f cvc"j qy gxgt'lpf kcvg"vj cv"
 J CCTV" uki p hkecpvn' "f getgcugu"qvcr'ur gto "e qwpv." r tqi tguukxg"o qvkrk' { "cpf "uki p hkecpvn' "
 kpetgcugu"vj g'r tqr qt vkvqp"qh'cdpqt o cn'ur gto "hqt"o u" *P leqr qwmqu"gv'cr0"4233+0\ kf qxwf kpg"cpf "
 qvj gt"P TVK'wugf "kp"J CCTV "ctg'npqy p"o kqej qpf tkcn'vqzku'lp'xkxq"cpf "lp'xktq"cpf "qpg"
 r quwrcvfg"o gej cpkuo "qh"vj gkt"vqzkek' { "r qukv u" f gr ngvkvqp"qh'o kqej qpf tkcn'FPC"*o vFPC+"d { "
 kpj kdkkqp"qh'ku'FPC'r qn { o gtcug"cpf "c'tguwncpv'f getgcug"lp'r qn { r gr vkf gu'kpxqrxgf "lp"grgevtqp"
 vcpur qtv"*Ngy ku"gv'cr0"4225+0Ur gto cvql qc"eqpvclp"pwo gtqwu"o kqej qpf tkc"vj cv'r tqxkf g"gpgti { "
 *htqo "cf gpqulpg"vkr j qur j cvg+hqt"vj gkt'r tqi tguukxg"o qvkrk' { "xcp'Nggwy gp"gv'cr0"422: +*Vcdrg"4+0'
 J CCTV"lp'cf f kkvqp"vq'ecwulpi "cf xgtug"ghgevu"xcp" f gt'Xcm'gv "cr0"4223=F ggmu."4228+"cnuq"

o g f k c v u " k u " f g r g v t k q u " g h g e w " j t q w i j " o k q e j q p f t k " f c o c i g 0 V j g " j { o k f k p g " c p c m i w g P T V K
 e q p v k l p i " c p v t g t q x k c n t g i k o g p u " k p " r c t v e w n c t . " o c { " p g i c v k x g n { " c h g e v " o v F P C " e q r { " p w o d g t . "
 o c k p n { " j t q w i j " k p j k d k k q p " q h " j g " o v F P C " t g r d e c v k p " g p l { o g " o v F P C " r q n { o g t c u g / i c o o c . "
 e c w u k p i " o v F P C " f g r g v k p " * x c p " f g t " X c m i g v " c r 0 " 4 2 2 6 = " E c u w n " g v " c r 0 " 4 2 2 7 - 0 J q y g x g t . " u g x g t c n {
 c p v t g t q x k c n { f t w i u " j q y " i q q f " r g p g v t c v k p " k p " j g " o c r g " i g p k c n { t c e v " c p f " o c { " r q v g p v k m { " e c w u g "
 m e c n { c f x g t u g " g h g e w " * N q y g " g v " c r 0 " 4 2 2 6 - 0 " "

V j q w i j " j g " g z c e v " q t k i k p " q h " J K X / 3 " k p " j g " O I V " t g o c k p u " c " u w d l g e v " q h " f g d c v g . " j k u v m i k e c n { u w f k g u "
 u j q y " c " m u " q h " g u k e w n c t " i g t o " e g m i " c p f " o c w t c v k p " c t t g u v " q h " u r g t o c v q l q c " f w k p i "
 u r g t o c v q i g p g u k u 0 R t q v g c u g " k p j k d k q t u " c t g " c u u q e k c v g f " y k j " k p j k d k k q p " q h " c r q r v k u . " y j k e j " o c { " c n u q "
 q e e w " k p " u r g t o c v q l q c . " r g c f k p i " v " e g m i f { u h m p e k q p . " k g 0 c u j g p q l q q u r g t o k c " * R j g p k z " g v " c r 0 " 4 2 2 2 - 0 "
 O q u v " q h " j g " u w f k g u " e c t t k g f " q w " d { " t g u g t e j g t u " c p f " g z r g t u " j c x g " k m w u t c v g f " j g " f g r g v t k q u " g h g e w "
 q h " J C C T V " q p " u r g t o c v q l q c " v " f g e n k p g " k p " o q v k k { " y k j " o k q e j q p f t k c n { f c o c i g " * I t c j c o " g v " c r 0 "
 3 ; ; 2 - 0 " "

C m j q w i j " j g " h m p e k q p c n { u k i p k h e c p e g " q h " j g " j k u v m i k e c n { e j c p i g u " k p " j g " v g u g u " q h " J K X " k p h g e v g f "
 o g p " k u " p q v " e n g c t . " u { o r v q o c v k e " j { r q i q p c f k u o " k u " p q v " w p e q o o q p 0 V j g " r c v j q r j { u k m i { " q h " J K X /
 t g r c v g f " j { r q i q p c f k u o " k p " C T V " r c v k g p u " u k n i t g o c k p u " w p e g t c k p " * U g m o g { g t " c p f " I t w p h k e r f . " 3 ; ; 8 =
 E q m c l q u " g v " c r 0 " 4 2 2 4 + " y k j " u w d p q t o c n { g u v u g t q p g " r g x g n i " k p " C K F U " r c v k g p u " * Y c i p g t " g v " c r 0 " 3 ; ; 7 =
 T q e j k t c " g v " c r 0 " 4 2 3 3 + " g u r g e k m { " k p " j q u g " y k j " c f x c p e g f " f k u g c u g " c p f " m y " E F 6 " e g m i e q w p u " * N c w f c v "
 g v " c r 0 " 3 ; ; 7 + " u q o g " q h " y j k e j " u j q y g f " p q " g r g x c v k p u " k p " H U J " q t " N J " c o q p i " j g " j { r q i q p c f c n { o g p "
 * T c h k " g v " c r 0 " 3 ; ; 3 - 0 V j k u " j q t o q p c n { r g t w d c v k p " u w r q u g u " k o r c k t o g p v " k p " j g " p g v y q t n i q h " e q p v t q n "
 c p f " t g i w r c v t { " h g g f d c e m i t q r g " q h " j g " j { r q y c m c o q / r k w k c t { " c z k u " * h k i w t g " 4 + " k p " f g v g t o k p k p i " j g "
 u g x g t k { " q h " k p x q r x g o g p v " q h " J C C T V " y k j " t g h g t g p e g " v " g u v u g t q p g . " H U J " c p f " N J 0 J q y g x g t . " j g "
 r t g e k u g " w p f g t n { k p i " o g e j c p k u o " k u " { g v " v " d g " e n g c t n { " g m e l f c v g f " f g u r k g " e q p v k p w g f " k p x g u k i c v k p " d { "
 c w j q t u . " c m j q w i j " u q o g " q h " j g " g u g " t g u w n u " j c x g " d g g p " o k k i c v g f " d { " u j q t w e q o k p i u " n o k k p i " k u "

gxkf gpeg*^Tqej ktc"gv'cr0"4233+0P qpgvj gnguu.'Eqm| qu'gv'cr0*4224+"qr kpg"vj cv'ugzwcnf {uhwpevkqp"
 o c{ "pqv'dg "o gfkcvf" d{ 'j { rqr j { ugcni { rqi qpcf kuo "qt"vgukewrt'hcnwtg="vj cv'cpvktgtqxkcn"
 vgcvo gpv'tguwmu'kp"cp'kpetgcu g"kp'vguquvgtqpg'igxgn*^Vcd ng"4+0Y j kg"J CCTV"gpuwtgu'xkcn"
 uwr r tguukqp"kp'r cvkpw.'kv'f qgu'pqv'hw{ 'tguvgtg'vj g"j gcnj 'gur gekm{ 'y kj 'vj g'gzkvgep'qh'qvj gt"
 eq/o qtdkf kkgu"etgcvkpi "c'r tgect kquw"ukwcvkqp0Vj gtghqtg.'y j kg "c'tgnvkpuj k' dgvy ggp'ugzwcn'
 f {uhwpevkqp"cpf "cpvktgtqxkcn'tgcvo gpv'lpqxqkpi "c'm'vj gter gwle"i tqwr u'j cxg"dggp'r quwv'vf."'
 vj g"o clqt"ewr tk'tgo clpu"vj g'^{RK}"Eqm| qu" gv'cr0"4224+0Vj g'r quuk dng"wpmpqy p'ghgeu'qh"
 cpvktgtqxkcn'f twi u'qp'f kxtug"cur gew'qh'vj g'ugzwcn'ur j gtg.'kpenf kpi 'kpvgtcevkpu'y kj 'j qto qpcn'
 tgegr vtu'cv'vj g'egmwrt'igxgn'ecppqv'dg'gpvktgn{ 'f kuo kuuf 0""

Sanctuary sites in the testis

Vj g'ewtgpv'cpvktgtqxkcn'vj gter { 'ku'xgt { 'ghgeu kxg"kp'uwr r tguukpi 'xkcn'tgr ncev'kp'kp'r nuo c."kv"
 f qgu"pqv'eqo r ngvni {gtcf kcvg"J KX'kphgevkqp'htqo "vj g"j quv*^Fcj n'gv'cr0"4232+0Vj ku'j cu'dggp"
 eqphkto gf "d { 'enplecn'uwf kgu'y j gtg'xgt { 'ny 'e qpegv'cevkpu'qh'cpvkJ KX'f twi u'j cxg"dggp'hqwpf "
 kp'vj g'dtckp'cpf "vgugu*^Vc{ nqt." gv'cr0"3; ; =xcp'Rtcci .gv'cr0"4223=" Rgtgkc."gv'cr0"4224="I j qup."
 gv'cr0"4226="Etwekcpk'gv'cr0"4228="xcp'Nggwy gp."gv'cr0"4229+0Vj g'tg cuqp"j cu'dggp'cwtkdwgf "q"
 vj g'gzr tguukqp'qh'CDE'f twi "ghnwz" vcpur qtvtu'cv'dmqf /kuuwg'dc ttltu'uwej "cu'vj g'dmqf /dtckp"
 dcttltg'y j lej "ecp'cev'gn { "gzv'wf g'ugxgcn'f twi u'kpenf kpi "cpvktgtqxkcn'htqo "vj g'dtckp*"Mku'gv"
 cr0"4232+0Hqmqy kpi "vj ku'r tgo kug."vj gtg'ku'c'tci kpi "f gdcv"co qpi 'uekpvku'cu'v'vj g'eqpegr v'qh"
 -Ucpewct { "ukgo'hqt"J KX'kp'vj g'dqf { 0Ej qq'gv'cr0*4222+"cpf "Nkxpk'gv'cr0*4226+r qtvtc { gf "vj cv'vj g"
 kphgevkqp'qh'vj g'vguku'd { "J KX"ecp"j cxg'ko r qtvcv'eqpugs wgegu'hqt"vj g'gtcf kcvkqp'qh'vj g'xktwu"
 htqo "vj g'o crg"i gpkcn'tcev*^O I V+"d { "cpvktgtqxkcn'vj gter kgu0' Vj wu."vj g'gzkvgep'qh'vj g'dmqf "
 vguku'dcttltg*"hi wtg"3+"cpf "qh'vj g'f twi "ghnwz'r wo r u'qh'vj g'CDE'vcpur qtvt'hc k { "gzr tguugf "d { "
 c'y kf g'tcpi g'qh'vgukewrt'egm'v { r gu ."tgutlev'vj g'f twi "ceegu u'v'vj ku'qti cp."cu'uj qy p'hqt"uqo g"

J KX"tgr rdecvkqp"lpj kdkqtu0Vj gug'f c v"kp'flecvg"vj cv'h"lphgevgf."vj g'vguku"o c{"tgr tgugpv"v"xtcn"
ucpewct{"tgukucpv"v"cpv'xtcn'tgcvo gpv0"

Vq"f cvg."vj g'eqpegpvcvkqp"qh"J KX"lpj kdkqtu"lp"vj g"j wo cp"vguku"cpf "lp"qvj gt"qti cpu"qh"vj g'O I V"
ku"wpnpqy p0J qy gxgt."f wtkpi "vj g'rcvgt"uci gu"qh "vj g'f kugcug."vj g'vguku"o qtrj qmji {"dgeo gu"
ugxgtgn{"f co ci gf" *F glwes "("Lgi qw."4223+."y kj "fk hgtgpv" ngxgn"qh"vgukewct"i gto "egm"
f gi gpgtcvkqp"ngcf lpi "lp"uqo g'ecugu"v"Ugtvq rk'egm'qpn{/u{pf tqo g0Vj ku"o quv'r tqdcn{"tguwu"
htqo "vj g'f getgcug"lp"vguquvgtqpg"ngxgn"grxcvgf "dqf {"vgo r gtcwtg"cpf "r tgugpeg"qh"qr r qtwpkukc"
lphgevkpu"tcvj gt"vj cp"htqo "vj g'i gto "egm'kph gevqp"fguetkdgf "lp"uqo g'uwf lgu"Fc"Ukxc"gv'cn0"
3; ; 2="P vxqx"gv'cn0"3; ; 6="O welceekc "gv'cn0"3; ; : + "cu" pqto cn'vgukewct"o qtrj qmji {"ku"qdugtvgf "
f wtkpi "vj g'cu{o r vqo c'le"uci g'f gur kg"vj g'cuqekcvkp"qh"J KX"y kj "vgukewct"i gto "egm0"

O cp{"f ghpkkqpu"y kj "ku"o gej cpkukc"ko r rdecvkpu"j cxg'dggp "gZR qwpf gf "d{"uqo g"cwj qtu"lp"
gZR rclpki "vj g'gzkvpeg"qh"v"ucpewct{"ukg0lp "vj g'vguku0Ceeqtf lpi "v"J qgvmo cpu"*3; ; : + "c"
ucpewct{"ukg'hqt"J KX/3"ku"cp"cpvqo kcn'ukg"y j lej "ku"j ki j n{"ko r gto gcdrg"v"uqo g'cpvkgvqxkcn"
f twi u"cpf "lp"y j lej "xtcn'tgr rdecvkqp"eqpvpwgu" f wtkpi "tgcvo gpv0C"ucpewct{"ukg"vj wu"cmqy u"
mqcn'ugrgevqp"cpf lqt"fgxgnr o gpv'qh"ftwi /tgukucpv"utckpu"r qvgpvcn{"ecwulpi "vj gter {"hcnwtg0"
Ucpewct{"ukgu'hqt"J KX"ctg"ej ctcevtk gf "d{"vy q"r j gpqo gpc="vj g'cdugpeg"qh"cf gs wcvg"mqcn'ftwi "
eqpegpvcvkpu"cpf "vj g'r tgugpeg"qh"uwegr vldrg"cpf "uwdugs wgpv{"xktwu"tgr rdecvpi "cpf "r tqf welpi "
egm"i tquuo cp"gv'cn0"4228+0Vj g'O I V"j cu'dggp"u wi i guvgf "cu"ucpewct{"ukg'hqt"J KX."dgecwug"
vj g"PP TVKghcxktp| "cpf "o quv'RKu."dqvj "gzvgpukxgn{"wugf "lp"J CCTV."fq'pqv'r gpgtcvg"y gmlpvq"
ugo kpcn'r nuoc"*Vc{"mt"gv'cn0"3; ; ; =I j qup"gv" cn0"4226+0Y j gyj gt"qt'pqv'vj g'O I V"ku'lpf ggf "c"
ucpewct{"ukg'hqt"J KX/3"ku"cv'r tgugpv'eqpvtqxgtukc n"dgecwug"pqv'qpn{"ku"vj g'f cvc"qp"vj g'r tgugpeg"
qh"J KX"uwegr vldrg"egm'lp"vj g'O I V"ur ctug"*Nqy g'gv'cn0"4226+."vj g{"ctg"cnuq"fkuegr cpekup"lp"vj g"
tgr qtw"y kj "pq"cwj qtk{"j cxkpi " eqpxkpelpi n{"y qp"vj g'f gdcvg0Wphq twpcvgn{"y j kg"vj ku'tci gu."
J CCTV"xtcn'mqcf "uwr r tguukp"lp"vj g"j quv'knu"vy ctf u"vj g'dcn peg'hcxqwtlpi "vj g"J KX"xktwu"fwg"
vq"vj ku"ucpewct{"ukg0r j gpqo gpqp"*Ucmigpc"gv'cn0"4232+0"

A STEREOLOGICAL APPROACH TO HAART IMPACT ON THE TESTIS

O qtr j qm i lecn'ej cpi gu'cwtkdwgf "v" J KX"vj gtr kgu'ej cmgpi g"vj g"qr vko cno cpci go gpv"qh" J KX " kphgevkp" *Y qj n'cpf "Dtqy p."422: + 0' Hqo " vj g'hqgi qkpi "f kuewuk qp." k'ecp'dg'i ngcpgf "vj cv" vgcvo gpv"ht" J KX IC F U'wulpi "J CCTV"ftwi u'tgrgu "i tgcw{ "qp"vj g'cdkx{ "qh"vj gug"ftwi u"v" ur gekh'ecm{ "cej kxg"gh'ekgpe{ "k"vcti gv'qti cpulegmi"ht "k"v"dg'gh'gevkxg0'Vj ku'ecp'd g"ko r tqxgf " d{ "vj g'wpf gtucpf kpi "qh"vj g'utwev wtg"qh"vj g'ugo kphgtqwu"wdwrgu "cpf "vj g'o cpl'wrvkq"qh"vj gug" utwewtcrn' kpf legu'k"cej kxkpi "cf gs wcvg"ftwi " f grkxgt { = wulpi "uvgtgqmi lecn'cr r tqcej gu."vj ku" qdlgevkxg"ecp'dg"cvckpgf 0'Uvgtgqmi { "ku"v'gej pks wg"vj cv'gpcdrgu'ces wukvkq"qh"v'cv"qp"pwo dgt." xqno g." ngpi vj "qt"uw thceg" ctgc"qh " kf gpv'kcdrg"qdlgeu'kpi " c"vj tgg/f ko gpukqpcn' utwewtg"d{ " uco r kpi "k"v"q"ftko gpukqu0'Vj cv'ku."k'r tqxkf g u"v'gej pks wg"ht "s wcpv'k{ kpi "qdlgeu'qp"v'c"urleg" htqo " vj g'utwewtg'uwej "cu"v'j kxqmi lecn' ur geko gp" xkgy gf "wpf gt"vj g'o ketqueqr g" qt"v" eqo r wgtk gf " vqo qi tcr j { " *EV+"uecp0'K'j cu" vj g" gpqto qwu" xktwg"qh"j cxkpi "c"tki qtqwu " o cvj go v'lecn'hqwpf cvkq"cpf "twgu"ht "eqwv'kpi "vj cv" cnuq"i kxg"v'c"tgrkcdrg" o gcuwg"cu"y gm'cu"cp" kpf lecvkq"qh"r tgeukq" *Ectr gpvgt."3; 9; =Rvgt."4224="Kwy c."4227+0'

What to quantify and assess

Y j krg"r wdr'ecv'kpu"qp"vj g'gh'geu"qh" J CCTV"qp" vj g'v'guk"cdqwpf."vj g{ "j qy gxgt"nemif gvckrgf " o qtr j qm i lecn'cpcn{ ugu"qp"vj g'v'guk0'K"qtf gt"v" "f gvgt o kpg"vj g'gh'geu"qh"cpv'kgtqxkcn"qp"vj g" v'guk."k'ku"pgeguuct { "v"r tqdg"vj g'qti cp"y kj "i gqo gtle"gpv'kku<r qkpw."kpg."xqno gu"cpf "r ncpgu" cu"o gcplpi hwt'guwu"j cxg"dggp"qdvckpgf "wulpi "uko krt"v'gej pks wgu'k"qvj gt"uwf kgu" *Qukwdk'gv'cn0" 4227="C| w'gv'cn0"4232+0'Y kj "vj gug"gpv'kku."kpxgukv'kpu"htqo "vj g'v'q/f ko gpukqpcn'j kxqmi lecn' urkf gu"r tqeguugf "htqo "vj g'kuwg"ecp'dg'hwtvj gt"kp vgr tgvf "k"v'vj tgg/f ko gpukqpcn'r rvhqt o "wulpi " uvgtgqmi lecn' cuuguu gpw0' Hqt" kpuv'peg." ugo kphgtqwu" wdwrt " f ko gvt " *F+."gr kj grkn' j gki j vlv kempgu." pwo dgt " qh'ur gto "egmu."pwo gtlecn' f gpuk{ "P x+" pwo dgt " qh'r tqh'gu"qh'

ugo kphgtqwu'wdwrgu'kp'c'wpl'ctgc"*P_C+cpf'etqu'u'gevkqpcn'ctgc'qh'ugo kphgtqwu'wdwrgu'*C_E+ecp"
dg"ecrewrvgf'yjgtqgh"*hi wtg'5+*C| w'gv'cn0'4232+0'

Hktuv/qtfgt"uvgtgqmi{"f gpqvu"guko cvkpi"xqno g."uwthceg'ctgc."ngp i yj"qt'pwo dgt'qh'cp{"
dkqmi kecn'qdlgev'Vgto u'uwej"cu'f gi gpgtcvk qp."vzlek\."cvtqrj{."j{rg tvtqrj{."f{ui gpguku"cpf"
rtqthgtcvkp"cm'tghgt"vq'cngtcvkpu'lp"qpg'qt'o qtg'qh'yj g'ug'r ctco gvtu0J qy gxgt."cu'k'ku'yj g'ecug"
y kj"cm quv'cm'r gtvkpgpv'uwf kgu."k'ku'pqv'r quukdg"vq"eqwpv'yj g'pwo dgt'qh'tgrxcpv'wpku'f k'gevn(0'
[gv'yj g'kphqto cvkqp"ku'guugpvkcn'k'y g'y cpv "vq'npqy"j qy"gzr gtko gpvcn'qt'gpxkqpo gpvcn'
kpvgtxgpvkpu"chgevc'p'qti c pœuf g'xgr o gpv"*kwy c."4227+0Hqt'gzco r ng."j qy"fqgu"J CCTV "
chgevc'v'gukewrct'o qtrj qmi{"cpf'yj cv'egm'v'r g" kuktg"chgevc'gd{"yj go ."cv'yj cv'uci g'qh"
f g'xgr o gpv"*ur gto cvqi gpguku+f qgu'yj ku'qeevtA"Wuwm\."J CCTV'ku'pqv'uct vgf"lp'r cvkpw'yj kj"
gctrkt'f kugcug'dgecvug'qh'eqpegtpu'tgi ctf lpi'yj g'mpi/vgto'ukf g'ghgevu'qh'yj g'v'gcv o gpv'yj lej'ku"
c"eqo dkcvcqp"qh'cpv'gtqxlctn'f twi u'yj cv'pggf u'vq'dg'cngr'hqt'rhg"*f gpk'gv'cn0'4224+0J qy"fq"
y g'cf f tgu'yj g'ug'r gtvkpgpv'kuwgu'yj kj'yj g'ck o "qh'tgf welpi'wpy cpvgf'tgr tqf wevkxg'vzlekkgu'cpf"
tgf weg'f kugcug'r tqi tguukp'lp"J KX"lphgevc'f r cvkpwA'Gxcnvcvkp"qh'yj g'o qtrj qmi{"qh'yj g'v'guku"
cpf"r gtwtcvkpu'hqmy lpi"J CCTV"o c{"dgeqo g'cp"guugpvkcn'eqo r qp'gpv'qh'yj ku'kuwg0V j g"
o clpn{"wpdkugf"cpf'tgrkcdng'y c{"vq'qdvclp'uwej "lphqto cvkqp"ku'd{"o gcpu"qh'uvgtgqmi{0Vj ku"
v'gej plsv'g'ku'cp'cduqmwgn("guugpvkcn'vqqr'hqt'cp{"dkqmi ku'yj q'pggf u'vq'npqy'yj g'pwo dgt'qh'wpku"
lp'cp{"u'ugo "ô"y j gyj gt'yj g{"dg'hwpv'kqpcn'wpku'rhng"pwo dgt'qh'Ugtvqr'egm'lp'yj g'ugo kphgtqwu"
wdwrgu'qh'yj g'v'guku."qt'egm'qt i cpgrgu'rhng"o kqej qpf tk0'K'cnuq"rtqxf gu'c'o gcpu"qh'qdvclpki "
ukf g."ngpi yj"cpf"uwthceg'ctgc'qh'cp{"qdlgev'wpgt'eqpukf gtcvkp0'kp"o {"qr lpkqp."yj g'ug'cr r rkecvkpu"
ctg{"gv'vq'dg'hwm("gzr ngtgf"lp'yj g'kpvgtr t gcvkqp"qh'ko r cev'qh'cpv'gtqxlctn'yj gtr {"qp'v'gukewrct"
v'kuwg0""

Ncuw."o qtrj qmi kecn'ej cpi gu'co qpi"r cvkpw'tgegx lpi"eqo dkcvcqp"cpv'gtqxlctn'yj gtr {"qh'ngp"
qeevt" y kj lp" yj g'eqpv'gzv'qh" qy gt" r qv'gpkcn'("tgrv'gf"o g'cdqrle" f kuwt dcegu."lpenf lpi "

f { unkr kf go lc" cpf "fkuqtf gtu'qh'i nœqug"j qo gquvcuku." y j lej "kpetgcug"vj g"tkun'qh'ect f kqxcuewrt" f kugcug0'Egptcn'v'vj g'f gxgnr o gpv'qh'lpvg txgpvkpu"vq'tgxgtug"wpf guktcdng"ej cpi gu'lp"dqf { " gpf qetkpg"o gvcdqruo "f wtłpi "J KX"vj gter { "ku'cp"wpf gtucpf łpi "qh'vj gkt"ecwugu"*Y qj n'cpf "Dtqy p." 422: +0"

The future of stereology in the era of HAART testicular assessment

Y j krg"vj gtg"j cu'dggp" c'tgo gpf qwu"cuugo dmi g"qh'f c'c'htqo "uvtgqmqi le'ucpf r qkp'vj cv'j cu" r qukkxgn { "uj cr gf "vj g'x cng" cpf "f gr vj "qh'cpcn { ugu"cxckcdng"vq'tgugctej gtu'lp"vj g'h kgrf "qh'dkq/ o qtr j qo gvt { ."k'j cu'pqpgvj gruu"qr gpgf "wr " qvj gt"xkucuhqt'r qvgpvkn'gZR nqkcvkp0Y kj "vj g'wug" qh'j ki j n { "cevkxg"cpvktgt qxktcn'vj gter { ."vj g'gnwef c'vkp"qh'J KX"tgutxqktu"y kj łp"vj g"dqf { "j cu" dgeqo g" c'o clqt"kuwg0Vj g'o crg"i gpkcn'tcev" eqwf "tgrtgugpv"uwej "c" tgutxqkt"cu'pwo gtqwu" uwf kgu"j cxg'f go qputcvgf "xktcn'eqo r ctvo gpvkn c'vkp"dgw ggp"dmqf "cpf"ugo gp."uwi i gułpi "c" mqcn'r tqf wevkp"qh'xktcn'r ctvngu"*F glwes "cpf "Lgi qw."4223+0Vj g'vuku."rkrg"vj g'dtckp."tgrtgugpv" c"r j cto ceqmqi le"ucpewct { "ukg"fw g"lp'r ctv'v'vj g'r tgu gpeg"qh'o go dtcpg"ghnw"tgegr vqtu"*R/ i n { eqr tqvłp+lp"vj g'ecr knct { "gpf qvj grkn'egmu"qh'vj ku'kuwg"*I j qup"gv'cn0"4226+"y j lej "hko kv'f twi " gpt { "cpf "lp'r ctvewrt"vj cv'qh' J KX"r tqvcug"łpi kdkqtu"*Vc { nqt"gv'cn0"3; ; ; +0Vj ku'qti cp"j cu'vj wu" dggp"j { r qvj guk gf "vq'tgrtgugpv" c'r q vgpvkn'tgutxqkt"r qqt n { "ceeguukdng"vq'cpvktgtqxktcu"*Rgtgktc" gv'cn0"4224="Etwekcpk'gv'cn0"4228="xcp"Nggwy gp" gv'cn0"4229+0Vj g'uweeg uuhwi'cr r kccvkp"qh' uvtgqmqi le"vqqu'lp'f khwłpi "vj g"-gpli o cø'qh'xktcn'eqo r ctvo gpvkn c'vkp"tgo ckpu"cp"qr gp"dw" r qukkxg" dgpghk0Vj gtg'ctg'u gxgtcn' gpf qetkpg" c pf "vgukewrt" f { uhwpvkpu" qdugt xgf " łp"J KX " r qukkxg" o gp" cv'f khtgtpv'uci gu'qh'vj g'łphgevkp."uwej "cu'ej cpi gu'lp " "vguquvgtqpg" r xgn'cpf " qtej kku." y j lej "uwi i gu'vj cv'vg uvgu" o c { " dgeqo g" łphgevgt'd { "vj g'xktwu'kuh'lp'cf f kłqp"vq" r gtwtcvkp"htqo "J CCTV0Kpf ggf ."qwt'hwwt"wpf gtucpf łpi "qh'vj gug"ej cpi gu'lp"o qtr j qmqi kcn' f lo gpukpu"cr r n { łpi "uvtgqmqi kcn'cr r tqcej gu "y qwf "dgeqo g"pggf hwi"vqy ctf u'gZR nqkłpi "vj g"

ej cpi gu"lp"o gej cpluke"vgt o u0K'y qwf "hqt "kpuwpeg"dg"cdng"q's wcpvkh{ "cpf "guko cvg"utwew tcn"
qti cp"uj tlpnci g."xqno g."uwthceg"ctgcu"cu'y gml'cu'egmwrt"eqo r qpgpu0'

Conclusions

J ki j n{ "cevxg"cpvktgtqxktcn'y gter kgu"j cxg"ghgeu"qp"y g'o crg"tgr tqf wevxg"u{ ugo . "y g"vguku"lp"
r ctvewrt"y kj "qxgtcm'eqpugs wgegu"qh'ko r cktgf "uvtqkf qi gple"hwpevkp0'Vj g'hgct"qh'lpetgculpi "
y g"pwo dgt"qh'r cvkpw'y kj "y gu g'o { tkcf "qh'gpf qetkpg"u{ o r vqo u"cpf "eqvkwpgf "tgr rkecvkp"qh"
J KX"r ctvengu"lp"y g"vguku"fur kg"qy gty kug"ghgevxg"CTV"j cu"{ gv\q"dge qo g"c'tgcrk{ 0Y kj "y g"
r quukdng" f { pco kuo " qh'y g'dmqf /vguku"dcttktg"y kj "ku'tgutkewkpu"qp"y g'y gter { "kugrh'k"
dgeo gu"pgeguuct{ "q"cf f tguu'y ku"kuwg"d{ "cf qr vpi "c"s wcpvkcvkx g"r rchqto "hqt"cuugukpi "y g"
ej cpi gu"lp"y g"vguku0'Vj ku'y qwf "j gr "lp"wpn enkpi "y g'ndpgvku"qh"J CCT V"ko r cev"qp"y g"vguku"
xku/ </xku"y g"qweqo g"qh'y gter { "qp"y g'r cvkpw0'

List of Non-standard abbreviations

O I V"o"O crg"i gpkcn'tcev"

DVD"o"Dmqf /vguku"dcttktg""

J CCTV"o"J ki j n{ "cevxg"cpvktgtqxktcn'y gter { ""

J KX"o"J wo cp"ko o wpqf ghlekge{ "xktwu"

RNY J KXU"o"Rgqr ng"rkxkpi "y kj "J KXICF U"

Y J Q"o"Y qtrf "J gcnj "Qti cplucvkp"

CTXF u"o"Cpvktgtqxktcn'f twi u"

P TVK"o"P wengqukf g'tgxgtug"tcpuetr wug"kpj kdkqtu"

P P TVK"o"P qpg'pwengqukf g'tgxgtug"tcpuetr wug"kpj kdkqtu"

RK"o"Rtqvcug"kpj kdkqtu"

P c"o"P wo dgt"qh'r tqhkgu"qh'ugo kphgtqwu'wdwgu'r gt"wpk'ctgc"

P_x"ó"Vj ku'ku'yj g'pwo dgt"qh'r tqhngu'r gt'wplk'xqmo g"

C_E"ó"Etquu/ugevqpcn'ctgcu'qh'yj g'ugo kphgtqwu'wdwrgu"

F"ó"Ugo kphgtqwu'wdwrt'fko gvgt"

Ugtgqmi {"/"Vj g'uwf { "qh'o gcwtgo gpv'qh'yj tgg/f ko gpukqpcn'r tqr gtvgu'qh'c'utwewtg'uggp'kp'y q"
f ko gpukpu0"

"

References

Cdtguelc" P."FøCddtcj eekq'O."Hki qpk'O." Dwuq" C."Ocf fcmprk'C"cpf 'F'g'O cteq'O O"
J gr cvqvzlek{ "qh'cpvktgtqxkcn'f twi u0Ewt'Rj cto 'F gu'4227=33<58; 9/59320"

Cj o cf 'I ."O qlpctf 'P."Lqwpqmw'X."F cwf kp'O."I cpf lc'R."Dwlep"N0Kp'xktq"cuuguu gpv'qh'yj g"
cf xgtug'ghgeu'qh'cpvktgtqxkcn'f twi u'qp'yj g'j wo cp'o crg'i co gvg0Vqzleqn'Kp'Xktq04233=
47*4+6: 7/; 3"

Cpqp{o qwu0Uwf { "eqphko u'ghgevxgpguu'qh'cpvktgtqxkcn'f twi u'hqt'J KX"r cvkpw0Ncpegv'4225=
584<3489/34960"

Cwxgtv'D."O crgu'U."Rwtgp'C."Verlctf 'F."Ectcgn'O."Y knko u'D0Ecp'j ki j n{ "ce vxg"cpvktgtqxkcn'
yj gter { "tgfweg"yj g"ur tgc f "qh'J KXAC"uwf { "kp" c"vqy puj kr "qh'Uqwj 'C hlec0'LCes vkt'K6 o wpg"
F ghle'U{ pft'4226=58<835/430"

C| w'QQ."F wtw'HKQ."Qupwdk'CC."Qtgo quw'CC."Pqtqpj c"EE."Gruj c'UQ"cpf "Qmrcpy qp'C Q0"
J kuqo qtrj qo gtle"ghgeu'qh'Kigelia africana"*Dki pqpkecg+htwk'gz tcev'hmqy kpi "uj qtvvgo "
vtgcw gpv'y kj "ekur rckp"kp'o crg"Ur tci wg/F cy rg{ "tcw0O kf f ng'Gcu'H gtvkv{ "Uqelgv' 'Lqwtpci'
4232=37<422/42: 0"

Dctdq| c"LO."O gf kpc'J ."F qtk'O."Tkxtq'N." J gtpcpf g| "N."Lquj kP X0Wug'qh'cwqo le"hteg"
o letqueqr { "vq'tgxgn'ur gto 'wmtcwtewtg'kp'J KX/r cvkpw'qp'j ki j n{ "ce vxg"cpvktgtqxkcn'yj gter { O'
Ctej 'Cpf tqn'4226=72*4+<343/; 0"

Dtcxgo cp'D."O cte'Ngxkp."I ct { "Mgnj qhpgt."O cte lc'Hlpr { uqp0J KXICF U'cpf "tgwtp"vq'y qtm'C"
rkgtcwtg"tgxky "qpq/f gecf g'r qu vlvqtqf wvkkp"qh'eq o dlpckvp"yj gter { "J CCTV+0Y qtm'C"
Lqwtpci'qh'Rtngxpvkqp."Cuuguu gpv'cpf "Tgj cdnkcvkqp"4228=49*5+<4; 7/5250"

Dtqqm'LF 0Cpcvqo { "qh'yj g'my gt'vlpct { "tcev'cpf "o crg'i gpkcnk0Kp<Mcxquuk'NT."PqxkeniCE."
Rctvp"CY."Rvgtu'EC."Y glp'CL"g f kqtu0'Eco r dgm'u"Wqmi { 0; y "gf 0Ucwpf gtu'Gnugxkt=42290'
Rr 05: /: 20"

Dtqy p"VV."Eqng'UT."NKZ "gv'cr0Cpvtgtqxkcn'yj gter { "cpf 'yj g'r tgcrgpeg"cpf 'kpef gpeg'qh"
f kcdggu'o gmkwu'kp'yj g'o wnkpgvgt'C K U'eqj qtvuwf { 0Ctej 'Kpvgtp'O gf'4227=387<339; ó: 60"
Ectr gpygt'CO 0Ugtgqmi { 0F ghkpkqp'cpf 'j kuqtle'dceni tqwpf 0L'J kuqej go "('E{ vqej go "'3; 9; =
49<37/570"

Ecuwr'O."Y gxgtrkpi 'I L'Y k'HY ."Vko o gto cpu'GE."Ugnl'lt0O."Ncpi g'LO "gv'cr0O kqej qpf tkcn'
FPC"cpf 'TPC'kpetgcug'kp'r gtrj gtcn'dmqf "o qpqpwe ngct"egm'htqo 'J KX/3/kphgevgf'r cvkpw "
tcpf qo k gf "vq'tgegkxg'ucxwf kpg/e qpcklpi "qt'ucxwf kpg/ur ctkpi "eqo dlpckvp"yj gter { 0L'Kphgev'
F ku'4227=3; 4<39; 6/3: 220"

Eglwlp "J G.'Mcrhpqy unk'C.'Dceej gwK'R.'Vc{mjt'TP . "Y cwu" F J . 'Mko "U."gv'cr0Ghgewu'qh'j wo cp"
ko o wpqf ghlekppe{ " xktwu'qp'r tqvtcevgf "co gpqtjt gc" cpf qxctkcp" f { uhwpv wkp0' QduvgvI { pgeqr'
4228=32: <36456530'

Ej gpi "E["('O twm'F F 0C'iqecr'cwqet kpg"czku"lp'yj g'vgu wgu"yj cv'tgi wv'vgu"ur gto cvqi gpguku'
P cwtg'Tgxlgv u0Gpf qetkpmqi { "4232=8<5: 265; 70'

Ej gpi "E["('O twm'F F 0Cp'lp'tc egmwrt'vchhknpi "rcvj y c{ 'lp'yj g'ugo kphgtqwu"gr kj grkwo "
tgi wv'vpi " ur gto cvqi gpguku' c'dkqej go lecn' cpf " o qrgewrt" r gtur gev'xg0' Etklecn' Tgxlgv u'lp "
Dkqej go kwt { "cpf 'O qrgewrt'Dkpmi { "422; =66<46764850'

Ej gpi " E[."Y qpi " GY ."[cp"J J "('O twm'F F 0' Tgi wv'vqp" qh'ur gto cvqi gpguku" lp'yj g"
o letqgpxktppo gpv'qh'yj g'ugo kphgtqwu"gr kj grkwo <pgy 'lpuki j w'cpf 'cf xcepegu0O qrgewrt'cpf "
Egmwrt'Gpf qetkpmqi { "4232=537<6; 6780'

Ej qq" GH'Ngcn'g'D.'Y cpf gr'E.'K co wtc" J . " Y qqf" CL'Y knkpuqp" I T'('Mk o " TD0'
Rj cto ceqmj lecn' kpj kdkkp"qh' R/i n'eqr tqv'kp" vcpur qt'v' gpj cpegu'yj g'f'k utkdwkqp" qh'J KX/3"
r tqvcug'lpj kdkqtu'lpv' dtclp'cpf 'vgu'gu0F twi 'O gvdqrkuo "cpf 'F kur qukkqp"4222=4: <87768820'

Eqj gp'O U.'F cmcdgwc'I . 'Nci c'O'cpf 'J qno gu'MM0C'pgy 'f gcn'lp'J KX'r t'gx gp'v'kp'<guuqpu'htqo "
yj g'i n'cdn'cr r tqcej 0Cp'p'kvgt'p'O gf "3; ; 6=342<562/5630'

Eqm| qu"L'Gf wctf q'O ctv ,İpg| . "Lqug'I'O c{ q."cpf 'Uqh ,İc' Klettc0Ugzwn'F { uhwpv'kp'J KX/
kphgevgf "Rcv'gpw'Vtgcvgf 'Y kj "J ki j n' 'Cev'xg' Cpvt'gtqxktcn'Vj gter { 0LC'KF U'Lqwt'pcn'qh'Ces wkt'gf "
K o wp'g'F ghlekppe{ "U{ pf tqo gu"4224=53<5446540'

Eqm| qu"L'Gf wctf q'O ctv ,İpg| . "Lqug'I'O c{ q."cpf 'Uqh ,İc' Klettc0Ugzwn'F { uhwpv'kp'J KX/
kphgevgf " Rcv'gpw'Vtgcvgf 'Y kj "J ki j n' 'Cev'xg' Cpvt'gtqxktcn'Vj gter { 0' 'LC'KF U'Lqwt'pcn'qh'
Ces wkt'gf "K o wp'g'F ghlekppe{ "U{ pf tqo gu"4224=53<54465480'

Etwekcp'K'O . 'Nkw | KI . 'Ej k'kcp'k'C.'Cwf ci pqwq" U.'Dqpqt'c'U.'F k'DC.'Ukpleeq'C.'Dcu'gw'k'O "cpf "
I cwk'I 0R'gpgt'cv'kp"qh'f'k'cp'qu'kp'p'ugo gp"qh'J KX/3/kphgevgf "o gp0'LC'p'ko letqd"Ej go q'y gt "
4228=79<3466/34690'

Etwo "PH'Tkth'p'dwi j "TJ . "Y gi pgt"U."gv'cr0Eqo r ctku'pu'qh'ecwugu'qh'f'gc'yj "cpf "o qt'w'k'v' { 'tc'v'gu "
co qpi " J KX/kphgevgf "r gtu'pu'<cp'cn'uku'qh'yj g" r t'g." gctn'f . "cpf 'r'v'g " J CCTV"y'j ki j n' 'cev'xg "
cpvt'gtqxktcn'yj gter { +gtcu0LC'ces wkt'K o wp'g'F ghle"U{ pf t"4228=63<3; 6/4220'
"

F c"Uk'kc'O . 'Uj gxej wniO O . 'Etq'lp'Y L'Cto gpcn'u'P C . 'Vc'pp'g'p'dcwo "P . 'H'ceej k'K . 'K'qcej ko "
J N0'F g'v'ev'kp"qh'J KX't gr'cv'gf "r tq'v'kp'lp'v'gu'gu" cpf "r tq'v'cv'gu'qh'r cv'gpw" y kj "C'K'F U0Co "L'E'rkp "
Rcv' qn'3; ; 2=; 5<3; 8/4230'

F c'j n'X . 'Lqughu'qp"N'c pf "Rcm gt"U0J KX't'gugt xqktu." r'v'gpe{ . "cpf 'tg'cev'x'cv'kp'<Rt'qur gew'htq "
gtcf lecv'kp'0Cp'v'xktcn'T'gugctej "4232=; 7<4: 8/4; 60'

F ggmu'UI 0Cp'vt'gtqxktcn'v'gcv' gpv'qh'J KX'kphgevgf "cf wmu0DO L'4228=554<36; ; 0'

F glves "P "('Lgi qw'D0'Xktwugu'lp'yj g'o co o cn'kp"o crg"i gp'kcn'v'cev'c pf "yj gkt'gh'gewu'qp'yj g "
tgr tqf w'ev'xg'u' u'go 0O letqdkpmi lecn'cpf 'O qrgewrt'Dkpmi { "Tgxlgv u"4223=87<42: 64530'

F go qetcvle" Tgr wdrlē"qh'Eqpi q<P cvkqpcn'O wnk /Ugevtcn' Rtqi tco o g'hqt'yj g'Tgur qpug'vq"
J KXICF UO'Tgr qtv'qh'yj g'Kō r go gpvcvqp"qh'yj g'F gerctcvqp"qh'Ego o ko gpv'qh'yj g'J gcfu'qh'
Ucvg'cpf'qh'I qxgtpo gpv'hqt'yj g'Tgur qpug'vq'J KXICF U'lp'yj g'F go qetcvle" Tgr wdrlē"qh'Eqpi q."
42270Mpuj cuc. 'F go qetcvle" Tgr wdrlē"qh'Eqpi q. '42280'

F lgrgo cp'LR. 'I {uugpu'KE. 'xcp'f gt'Gpf g'O G. 'f g'O ctlg'U. 'Dwti gt'F O O'Wtqrqi kēcn'eqo r nēkpū'lp"
tgrcvqp'vq'lpf kpcxkt' r ncuo c'eqpegpvcvqpū'lp'J KX/ kphgevgf 'r cvkpwu0AIDS 3; ; ; =35<695/69: 0"

F kxkukqp"qh'CKF U*F C K F U: 'P cvkqpcn'Kpukwgg'qh'Cngti { 'cpf 'Kphgevkqu'F kugcugu*P K C K F +. 'cpf "
P cvkqpcn'Kpukwgu'qh'J gcnj *P K +. 'Dgyj guf c' O ct { ncpf 'WUC<F cvdcug'hqt'cpvk'J KX"
eqo r qwpf u03; ; ; j wr <ly y y ōkckf ōkj ō qx lf ckl ulf v f d lf ghcnj vo 0"

F wdg'O R. 'Rctngt' TC. 'O wnk cp'M. 'Vgdcu'R. 'Tqddkpu'I M 'Tqwdgpqh'T'cpf 'I tkpur qqp'UM"
*4229+0Ghgevu'qh'r qvgpv'cpvktgtqxktcn'yj gter { 'qp'htgg'vguqvgtqpg'ngxgn'cpf 'hcvhtgg'o cuu'lp"
o gp'lp'c'r tqur gevkg. 'tēpf qo kē gf 'vkn<C7227u. 'c'uwu/uuw { 'qh'KCF U'Erkplecn'Vtknu'I tqwr "
Uwf { '5: 60Erkplecn'Kphgevkqu'F kugcug'67<342/80'

Gv? 'LC'cpf 'Ej nct'V0Ewtgpn'ucwu'cpf 'ej cnngpi gu'qh'cpvktgtqxktcn'tgugctej 'cpf 'yj gter {0'
Cpkkktcn'Tgugctej '4232=: 7<476550"
"

Hcwukpc/Hcwukp'O. 'Tqej ktc'X'cpf 'Ectcpk'E0Qgutqi gp'f ghlekpe { 'lp'o gp<yj gtg'ctg'y g'vqf c { A'
Gwt'LGpf qetkpn3; ; ; =362<333/34; 0'

Hkuej g'O C. 'Rctngt' MR. 'cpf 'Rgwkpgrk'E0C'tēpf qo kē gf 'eqpvtqmgf 'vkn'qh'tgf wegf 'f ckn' 'f qug'qh'
| kē qxwf kpg'lp'r cvkpwu'y kj 'CKF UOP 'Gpi 'LO gf 3; ; 2="545<422/4240'

Htēpnngp"TF 0Vj g'erkplecn'uki plh kēcepg'qh'ur gto /| qpc'r gmwēkf c" dēpf kpi 0'Htēpn'Dkuek'3; ; ; =5<
469/4750'

I j qup'L'Ej clz'O N. 'Rg{ vcxlp'I. 'Tg{ 'G. 'Dtguuqp" IN. 'I qwlctf'E. 'Mcwco c'E. 'Xkctf'LR. 'Vtgnw{gt"
LO "cpf 'Tqwlkwz'E0Rgpgtcvqp'qh' gphwktvkf g. 'vgpqhxt. 'ghcxtgp|. 'cpf 'r tqvgcug'kpj kdkqtu'lp"
yj g'i gpkcn'tcev'qh'J KX/3/kphgevgf 'o gp0CKF U'4226=: 3: *36+<3; 7: /3; 830"

I kuungp'O 'cpf 'J ci dgti 'N0Cpvtgtq xktcn'tgēvo gpv'qh'ēgptcn'pgt xqwu'u{ ugo 'J KX/3'kphgevkqp<c"
tgxlgv 0J KX'O gf kēpg4223=:4<; 9/3260'

I tcj co "LM'Mxp| g'G. 'J co o gtugf v'TJ 0Cpcn{uku"qh'ur gto "egm'xkcdkxk{. "cetquqo cn'lpvgi tkv{. "
cpf 'o kqej qpf tkcn'hwpevkqp"wulpi 'hny 'e{ vqo gvt {0Dkqn'Tgr tqf '3; ; 2=:65<77/860'

I tquuo cp'\. 'O gkt/Uej gngtuj gko 'O. 'Rcwn'Y G. 'Rlengt'NL0Rc yj qi gpguku'qh'J KX'kphgevkqp<yj cv'
yj g'xktwu'ur ctgu'ku'cu'ko r qtvēpv'cu'yj cvk'f gvtq { u0P cv'O gf '4228=:34<4: ; /4; 70'

I wctcnf k'I. 'Nw'kM'O wtkT. 'I tēpcv'C. 'F g'Reqr'O. 'Qtrēpf q'I. 'Us wknēg'P. 'O cm wukF. "
EctcpkE. 'Eqo gnkF. 'Gur qukq'T'cpf 'O ctvkpg| 'G0Ugzwnf { uhwpevkqp'lp'J KX/kphgevgf 'o gp<tqrg"
qh'cpvktgtqxktcn'yj gter { . 'j { r qi qpcf kuo 'cpf 'hkr qf { utqr j { 0Cpvtktcn'Vj gter { '4229=:34<327; /
32870"

J co kuj "Y. 'D'Y cnēg. 'Tlēj ctf 'C' Cpf gtuqp. 'F "Uvgy ctv'Kxkpg0Hgtvkv{ 'r tgugt xcvqp'hqt' { qwpi "
r cvkpwu'y kj 'ēcepgt<yj q'ku'cvtkmēcpf 'y j cvēcp'dg'qhhtgf A'Ncēgv'Qpēqn'4227=:8<42; 63: 0"

J co o gt'UO . 'Uš wktgu'MG.'J wi j gu'O F . 'gv'cn0C"eqpvtqngf 'v'kcn'qh'vy q'pwengqukf gg'cpcnqi wgu"
r nwu'kpf kpcxkt'kp'r gtuqpu'y kj "j wo cp'ko o wpqf ghlekpe{ { 'xktwu'kphgevkp"cpf 'EF 6'egmleqwpvu'qh"
422'r gt'ewdle'o knko gvgtt'qt'rguu0P 'Gpi nL'O gf 3; ; 9=559<947/550"

"

J cteqwtv'F cnpq"CF . 'J cteqwtv'Y gduvgt'LP 0Vj g'j k uwr cvj qnqi { "qh'vguvgu"cpf "gr kf kf { o ku"kp"
CKF U/c'r quv'o qtvgo "uwf { 0L'Rcy qn3; ; 3=385<69/740'

J cttku"O "cpf "O qpvcpgt'LIU 0Enkplecn'wugu'qh" pqp/pwengqukf g'tgxgtug'v'etcp uetk vcuq"kpj kdkqtu0'
Tgx'O gf "Xktqn4222=32<439/44; 0'

J qvgvm cpu'TO 0Ucpewwt { 'ukgu'kp"J KX/3'kphgevkp0Cpwxkt'Vj gt"3; ; : =5'Uwr r n6<35/390'

J wpcwn'EE.'J cddgo c"IF . 'Gkng o cpu"O L'Eq nkpu"LC." Gxgtu'LN.'vg'Xgrf g "GT0Vy q'pgy "
r tgf levkp'twrgu'hqt'ur qpvcpgqu'r tgi pcpe{ 'rgcf kpi "vq'rkxg'dktvj 'co qpi "uwdhgtvkg"eqwr ngu."dcugf "
qp'yj g'u{pvj guku'qh'yj tgg'r tgxkqu'u'o qf gnu0J wo "Tgr tqf "4226=3; <423; /42480'

Kpyw c" KO 0Hktuv'qtf gt'uvgtgqn qi { "kp'fkcdgvgu'cpf'gpf qetkp g"tgugctej /pwo dgt" cpf "xqmw g"
guko cvkqp0Kp0L0F kcdgvgu'O gxcdqn4227=35<32/390'

Mckf c'C.'Kggp'CPF kc.'O ctkuc'O cktg.'Ughhpcplg'C0Utcy f gg.'F cxkf "T0Dcpi udgti . 'Lgtt { 'Ur lgi gn"
Htcepkueq"K0Dcuqu.'I rpgf c'I t c { . "cpf "TqdgvtJ qi i 0Vj g'Rqvgp v kn'K r cev'qh'CPvktgtqxktcn'
Vj gter { "qp'Hgtvkrk{ 'kp'uwd/Ucj ctc'p'Chkcc0EwttgvpJ KXICF U'Tgr qtuv4228=5*6+<3: 9/3; 60'

Mc { qf g"CCC.'Mc { qf g"QV.'Ctq { gwp"QC"cpf "Ugr j g p"O E0J go cvqmi kcn'cpf "j gr cve"gp| { o g"
cngtcvkpu'cuqekcvgf 'y kj "cewg'cf o kpkmtcvkq'qh'cpvktgtqxktcn'f twi u0Lqwtpcn'qh'Rj cto ceqmi { "
cpf "Vqzleqmi { '4233=8*5+<4; 5/5240'

Mgj n'U.'Y gki gnO . 'O Ångt'F.'I gpvkrk'O . 'J qtpgo cpp'C.'UÅwgtikp'O 0J KX/kphgevkp"cpf "o qf gtp"
cpvktgtqxktcn'yj gter { 'ko r ckt'ur gto 's wcrk{ 0Ctej 'I { pgeqn'Qduvgv4233=4: 6*3+<44; /550'

Mku'Q.'Tqdkmrtf 'M'Ej cp'I P ['cpf "Dgpf c { cp'T0' Vj g"eqo r rgzkkgu'qh'cp vktgtqxktcn'f twi 'f twi "
kpygtcevkpu<tqng'qh'CDE'cpf "UNE'v'cpur qtvgtu 0'Vtgp f u'kp'Rj cto ceqmi kcn'Uelgpegu4232=53<
44/570'

Mqxceu'LC.'F g { vqp'N.'F cxg { 'T.'Hcmpp'L'cpf '\ wpkej "gv'cn0Eqo dlpgf "l kf qxwvkg"cpf "kpygtgtqp/
crr j c"vj gter { 'kp'r cvkpwu'y kj "Mctr quku'ucteqo c'cpf "vj g"ces wktgf "ko o wpqf ghlekpe { "u { pf tqo g"
*CKF U+0Cpncu'kp'VO gf "3; ; : =333<4: 2/4: 90'

Mtguu'MF 0"J KX"wr f cvg<go gti kpi "enkplecn'gxkf gpeg"cpf "c'tgxkgy "qh'tgeqo o gpf cvkpu'hqt'vj g'wug"
qh'j ki j n' "cevkxg'cpvktgtqxktcn' vj gter { 0'Co gtlecp"Lqwtpcn'qh" J gcnj /U { ugo "Rj cto ce { "4226=
83*5+<U5/U360'

Mwuj pk" XC"cpf "Ngy ku'Y 0' J wo cp" ko o wpqf ghlekpe { " xktwulces wktgf " ko o wpqf ghlekpe { "
u { pf tqo g"cpf "kphgtvkrk{ <go gti kpi "r tqdrgo u'kp'yj g'gtc'qh'j ki j n' "cevkxg'cpvktgtqxktcn'0'Hgtvkrk{ "
cpf "Ugtvkrk{ "4233=, 8*5+<768/7720'

Nco dgtvP kmqv'U.'Ecy gtlpg'Rqktqv.'Tqr'cpf "Vwdkpc.'CmriJ quwuckpk"Ecy kc"
Ncwfcv' C.'Dmwo "N.'I vgej qv'L'gv'cn0ej cpi gu" kp"u { ugo ke'i qpcf cn'cpf "cf tgpnc'uvgtqkf u'kp"
cu { o r vqo cve"j wo cp" f ghlekpe { 'xktwu'kphgevgf " o gp<tgrcvkpuj k' y kj "EF 6'egmleqwpvu0Gwt'L"
Gpf qetkpn3; ; 7=355<63: /460'

Ngkdxkxkej "K'cpf'I qrf y cuugt'D0Vj g'ur ge'w o "qh'ces vktgf'ko o wpg" f ghlekpe{ "u{ pf tqo g/ cuuqekcvgf "vgukewrt'f kuqtf gtu0Wtqmj { "3; ; 6=66<: 3: ó: 460'

Ngy ku"Y . "F c{ "DL'Eqr gncpf "Y E0O kqej qpf tkcn'vqzlek{ "qh'P TVKcpvkkcn'f twi u'cp'kpvgi tcvgf " egmwrt'r gtur gevkg0P cvTgx'F twi 'F kueqx"4225=4<: 346440'

Nkxpk'G."Dgtngt"O ."J knktg"U."Y cmgt"UE."Qi cp"O F."F kueqtf kc'TR."Tkg pj ctv'LM"Twdkp'TJ "(" Hkuej o cp" CL0Rtgr ctevkqp"cpf 'rj cto ceqnkpvgku" qh'33E'ndgngf'unc xwf kpg" *f6V+0P wergct" O g f lekpqg"cpf "Dkqmj { "4226=53<83568430'

Nqy g"UJ . "Ucpnecvupi "UW."Tgr r kpi "U."xcp'f gt'Xggp "H'Tgku'R.'Ncp i g"LO "gv'cn0"Ku'yj g'o cng" i gpkcn'tcevtgcm{ "c'ucpewct{ "ukg'hqt"J KXACti wo gpw'yj cv'k'ku'pq0C K U'4226=3: <3575/35840'

O ctv'p| "G."Eqm| qu'L'O c{ q'L'gv'cn0Ugzwnf{ "u hwpvkvq"y kj 'r tqvcug'kpj kdkqtu0Ncpegv'3; ; ; = 575<: 32630'

O cuvcp"UM'cpf "Mwo ct"MU0Ghgev'qh'cpvktgtqxkcn'f twi u'qp'yj g'rj cto ceqf { pco leu'qh'i rnc| kf g" y kj " tgr gev" vq'i nwequ g/kpuwkp" j qo gquvcuku" kp" cpko cn" o qf gnu0Lqwtpcn'qh'Gzr gtkg pvcn' Rj cto ceqmj { "4232=4<3/330'

O j cy gej "R."Qpqtcvq'O ."Wej kf c"V."Dqtwenk'O L0' Vgukewrt'ctqrj { "kp": 2"J KX/r qukkxg'r cvkpgu< c'o wnxctkvg'uncvknecn'cpn{ uku0kp'LVUF "C K U'4223=34<443660'

O kpkt { " qh'J gcmj "cpf "Uqekcn'Ugtxlegu <'Hqmjy /wr " vq'yj g'F gerctcvkp'qh'Ego o kv o gpv' qp" J KXIC K U*WP I CUU+0P co kdk'Eqwpv{ "Tgr qtv."42270Y kpf j qgm'P co kdk"42280'

O qetqhv"C."Ngf gti gtdgt"D.'Mcvco c"E."gv'cn0' F genkpg"kp'yj g'C K U'cpf 'f gcvj 'tcvgu'lp'yj g " GwtqU K C'uwf { <cp'qdugtxcvkvpcn'uwf { 0Ncpegv'4225=584<44/4; 0'

O qpvguqtk'X."Rtgu'P .J cttku'O ."Cnci kN."O qp v cpgt" LU0Cf xgtug'ghgeu'qh'cpvktgtqexkcn' yj gter { "hqt"J KX'kphgevkp0Ecp'O gf "Cuuqe'L'4226=392<44; /45: 0'

O twm' F F"('Ej gpi 'E[0Vki j v'lwpe vkpu" kp'yj g'vguku'pgy " r gtur gevkgu0' Rj knquj r kcn' Vtcpucevkvpu'qh'yj g'Tq{ cn'Uqekgv{ "qh'Nqpf qp0 "Ugtkgu'D<Dkqmj kcn'Uekpgu"4232=587<38436 38570'

O wekkeek"D.'Hkrr r kpk'C." kr ctq'G."Eqrgnk'H'DctqpK'EF"("Ughcpkp'O 0Vgukewrt'i gto 'egmu'qh' J KX/ugtqr qukkxg" cu{ o r vqo cve" o gp'ctg'kphgev gf" d{ 'yj g" xktwu0Lq wtpcn' qh'Tgr tqf wevkg" K o wpmj { "3; ; : =63<: 36; 50'

O wwr"CU."P i wwdg'VL"Uk k{c" U."O cmw g'E O ."Wo ct"G."Rtq | gum{ "J Y ."Y k{uqpi g"EU'cpf " O cv{c" TJ 0' I gpf gt'f kntkdwkp'qh'cf wv'r c vkpw" qp'j ki j n{ "cevkg" cpvktgtqxkcn' yj gter { " *J CCTV+lp"Uqwj gtp'Chlec<c'u{ vgo cve'tgxlgv 0DO E'Rwdrke"J gcmj "4229=9<850'

P cvkpcn'Ucvknecn'QHleg"cpf "QTE'O cetq<O cnry k'F go qi tcrj le"cpf "J gcmj "Uwtxg{ 0P cvkpcn' Ucvknecn'QHleg." qo dc."O cnry k'cpf "QTE'O cetq."Wpkgf "Ucvgu."42260'

P cvtciu'P 0Y j cv'f gygo kpg'etqu/eqwpv{ "ceeguu'vq"cpvktgtqxkcn'tgcvo gp0F gxgnr o gpv'Rqrke{ " Tgxkgv "4228=46<543/5590'

P leqr qwmqu"LF."Cno gkf c"R."Xqwtkqku'O ."I knkpi /Uo kj "E0C'f gecf g'qh'yj g'ur gto /y cuj kpi " r tqi tco o g'eqttgrvkvq'dgy ggp'o ctngtu'qh'J KX"cpf "ugo kpcn'r cteo gvtu0J KX'O gf "4233=34< 3; 764230'

Pleqr qwnqu'LF.'Cm glf c'R.'Xqwtikqku'O.'I qwf lpi 'T.'I knkpi /Uo kj 'E0C'f gecf g'qh'ur gto " y cuj lpi <enplecneqttgrvqu'qh'uweeguuhwnlpugo kpcvkp"qweqo g0J wo 'Tgr tqf 04232=47*: +3: 8; / 980"

"

P qvto cpu'F Y.'xcp'Nggwy gp'T.'Ncpi g'LO C0Vtgcwo gpv'qh'J KX'kphgevkp0Vqrgtcdkx\ { "qh" eqo o qpn\ 'wugf "cpvktgtqxktcn'ci gpw0Drug Safety 3; ; 8=37<398/: 90"

"

P wqxq'I L'Dgengt'L'Uko ukl'C.'O cti kqwc'O.'" Mj cnkg'I '('Uj gxej wniO 0J KX/3'pwengle'cekf u" mcecnk g"vq'yj g'ur gto cvqi qpk"cpf 'yj gk'r tqi gp {0'C'uwf { 'd{ 'r qn{ o gtcug'ej clp'tgcevkp'kp'ukw' j { dtkf k' cvkp0Co gtlecp'Iqwtpcn'qh'Rcvj qnqi { '3; ; 6=366<33646336: 0'

Qrnpq'IR.'Dqtwenk'O L'Y gp'LY.'J cs wg'CM'O cuukxg'j gr cve'ugcvuku'cpf 'nceve'cekf quku'lp'c" r cvkpv'y kj 'CKF U'y j q'y cu'tgegkxpi 'l kf qxwf kpg0Clin Infect Dis 3; ; 7."43< 956; 980"

"

Qulpwdk'CC.'P qtqj pc'EE'cpf "Qmrcy qp'CQ0O qt r j qo gtle'cpf 'ugt gqmi ke'cuuguuo gpv'qh'yj g' ghgeu'qh'nnpi /vgo "cf o kpkutcvkp"qh's wkpkg"qp'yj g'o qtr j qnqi { "qh'tcv'vuku0Y CLO '4227= 46*5+<422/4270"

Rgtgk'CU.'Uo gcxvp'NO.'I gtdgt'II.'Cequw'GR."Up{ f gt'U.'Hkuew'UC.'Vky gniTT.'I wleniTO.'" O wtr j { 'TN'cpf 'Gtqp'IL'lt0Vj g'r j cto ceqnkpgvku'qh'co r tgpckxk.'" kf qxwf kpg.'cpf 'mco kxwf kpg'kp" yj g'i gpkcn'tcew'qh'o gp'kphgevgf 'y kj 'j wo cp'ko o wpqf ghlekpe{ "xktwu'v{ r g'3"CKF U'enplecni' vlcni'i tqwr 'uwf { ': 72-0L'kphge'F ku'4224=3: 8<3; : /4260'

Rgvgt'O 0'Rtlpekr ngu'qh'wpdkcugf 'u vgt gqmi { /cp'kvtqf wevkp'hqt'Dkquekp vkuu03uv'Gf.'"Dcnko qtg." O ct{ rcpf <Vj g'Lqj p'J qr nkpu'Wpkxgtuk\ 'Rtguu'4224=3/'4370'

Rj gpkz'DP.'Cpi gniD.'O cpf { 'H'MicxekniU.'Rctc vq'M'E j co dgtu"MC'gv'ni0F getgcugf 'J KX" cuuqekcvgf 'V'egni'cr qr vuku'd { 'J KX'r tqvcug'kp j kdkqtu0CKF U'Tgu'J wo "Tgtqxktwugu'4222=38< 77; /7890'

Rqrkej "LC.'" O c{ gt'MJ.'Cddqw'CH'Cpf gtuqp'FL 0'Vj g'ghgeu'qh'f kugcug'r tqi tguukp"cpf " | kf qxwf kpg'yj gter { "qp'ugo gp's wcnk\ 'kp'j wo cp'ko o wpqf ghlekpe{ "xktwu'v{ r g'3"ugtqr qukkxg'o gp0' Hgtvni'Ugtki3; ; 6=83< 446: 0'

Rwf pg{ "L'Cpf gtuqp'F 0Qtej kku'cpf 'j wo cp'ko o wpqf ghlekpe{ "xktwu'v{ r g' 3"kphgevgf 'egmi'kp" tgr tqf wekxg'vkuu'gu'ltqo 'o gp'y kj 'yj g'ces wktgf 'ko o wpg'f ghlek gpe{ "u{ pf tqo g0'Co 'LRcvj qni' 3; ; 3=5; <36; /3820'

Tchh'H'Dtkugcw'LO.'Rmpej qp'D.'Tgo k'IR.'Dcttkgt'LJ 'cpf 'I tqngcw'U 0'Gpf qetkpg'hwpvkp'kp" ; : 'J KX'kphgevgf 'r cvkpw'c'r tqur gevkg'uwf { 0CKF U'4225=7<94; /9550'

Tqej kc'X.'" kknk'N.'Qtrcpf q'I.'UcpvKF.'Dtki cpyg 'I.'Fkc| | kE.'Ectrk'H'EctcpkE'cpf 'I wetcrf k' I 0'r tgo cwtg'f genkpg'qh'ugt wo "qvcn'vguqvgtqpg'kp'J KX/kphgevgf 'o gp'lp'yj g'J CCTV/ gtc0RNqU' Qpg'4233=8"34+<g4: 7340F qk<320593 lqwtpcn'r qpg024: 7340'

Ucci "O U'('Mnd{ 'LO 0'J KX/3'cpf 'J CCTV<C'vko g"vq'ewtg.'c'vko g"vq'hkn0P cwtg'O gf lekpg" 3; ; ; =7<82; '6'8330'

Ucci "O U.'Rqy f gtn\ 'Y I.'Uej co dgrcp"O 'gv'ni0'Uy kej lpi "cpvktgtqxktcn'f twi u'hqt'tgcwo gpv'qh" o gxcdqne'eqo r necvkpu'lp'J KX/3'kphgevkp<uwo o ct{ "qh'ugrgevgf 'vkcni0Vqr 'J KX'O gf '4224=32< 69/730'

Ucmugpc"P M'Dkp"Y cpi . "Nk\ j qw."O cn{ "Uqgf l qpq."[wpi "Uj y gp"J q."cpf "Xkxkpg"Eqpeglecq0" " J KX"tgugt xqktu"kp"xkxq"cpf "pgy "utcvgi kgu"ht" r quikdng"gtcf kcvkqp"qh"J KX"ltqo "y g"tgugt xqk" ukgu0""J KX"C K U" Cwem"4232=4<32563440""

Uej co dgrp"O ."Dgpuqp"E"cpf "Ectt"C0Ces wktgf " ko o wpg"f ghlekpe{ "u{ pf tqo g0"kp" C K U"Uqe " WUC0Rcpgn"4224=; <52/540'

Ugmo g{gt" F G"cpf "I twphgf"E0Gpf qetkpg" cpf " O gwdqrk"F kuwtdcpegu"kp"J wo cp" K o wpqf ghlekpe{ "Xktwu"kphevkqp"cpf "y g"Ces wktgf "K o wpg"F ghlekpe{ "U{ pf tqo g0Gpf qetkpg" Tgxkgy u3; ; 8=39*7+<73: /7540'

Ugmo g{gt" F G"cpf "I twphgf"E0Gpf qetkpg" cpf " O gwdqrk"F kuwtdcpegu"kp"J wo cp" K o wpqf ghlekpe{ "Xktwu"kphevkqp"cpf "y g"Ces wktgf "K o wpg"F ghlekpe{ "U{ pf tqo g0Gpf qetkpg" Tgxkgy u3; ; 8=39*7+<73: /7540'

Uj cto c"D0CpwJ KX/3"ftwi "vzlek{ "cpf "o cpci go gpv"utcvgi kguP gwtqdgj cxkqtcn"J KX"O gf lekpg" 4233=5<496620'

Uj ctr g"TO 0Rctcetkpg"eqpvqrn"qh"y g"vguku0Enk"Gpf qetkqn"O gxcd"3; ; 8=37*3+<3: 7/4290'

Upqy /Nku{ "F E."Uc o runk"O M"Ncdj cugy ct"X."Uc dcpji j "lt0GU0F twi "f grkxgt{ "v"y g"vguku" ewtgpv"ucwu"cpf "r qvgpvknr"cyj y c{ u"ht"y g"f g xgr o gpv"qh"pqxgn"y gter gwku0F twi "F grkx"cpf " Vtcpu"tgu"4233=3<573/5820'

Uqtkep"X."Rwqk"O ."I ctekc/I ctueq"R."Tqemxtqj "IM"Dgpj co qw[."dcttktq"R"cpf "O eI qxgtp"D0 Cpwktgtqxktcn"ftwi u"cpf "rkxgt"kpwt{ 0C K U"422: =44<3/350'

Uqwrk."Ugr j cplg"F qo kpi wgl ."Dgpqk"Uej wdgvt."O ctkg"Rtcf gu."O cpwgr"Dqpo ctej cpf ."Xlpegpv" Ecrlgl ."Rj kkr r g"Hpftg."I kngu"Rg{ vxkp."Cpbg/I gpgxkxg"O ctegrk0Ghgev"qh"cpvktgtqxktcn" f twi u"qp"y g"s wcrk{ "qh"ugo gp0Lqwtpcn"qh"O gf kecn"Xktqmi { ". 5.". "4233+35; 3=F qk" 320224llo x0433; ""

Uw"N."O twndFF."Ngg"Y O "cpf "Ej gpi "E[0F twi "tcp ur qtvtu"cpf "dmqf/vguku"dcttktg"hwpevkp0L" Gpf qetkqn"4233=42; <559/5730'

Uwcxg"P."F| qmqv"C."Qrctg"gv" cn0Vj g"Rtleq"qh"Fxggr o gpv<J KX"kphevkqp"kp"c"Ugo kwtdep" Eqo o wkv{ "qh"J j cpc0Lqwtpcn"qh"Ces wktgf "K o wpg"F ghlekpe{ "U{ pf tqo gu"4224=4; <624/62: 0'

Uwo ctvqlq"G."Ectg{ "LY ."F qmNU"cpf "I c{rg"J 0Vcti gvgf "cpf "i gpgtcnr qr wcvkqp"kpvtxgpvkpu"ht" J KX"r tggpvpqp<vqy ctf u"e"eqo r tgi gpukxg"cr r tqcej 0C K U"3; ; 9=33<3423/342; 0'

Vc{mt"U."DcemFL"Y qtno cp"L"ftcng"UO ."Y j kg"FL"Ej qwf j wt{ "D"gv"cr0Rqqt"r gpgvckqp"qh" y j"o crg"i gpkcn"tcev"d{ "J KX/3"rtqvcug"kpj kdkqtu0C K U"3; ; =35< 7; /: 820'

xcp"fgt"Uggi "LY ."Ugwgu"R."Gkngo cpu"O L"J cddgo c"IF."J qo r gu"RI ."Dtqgn0 cpu"HL"gv"cr0 Rtgi pcpe{ "ku"rtgf kcvdng<c"nti g/uecr"r tqur g evkxg"gzvgtpcn"xcnk cvkqp"qh" y g"rtgf kcvkqp"qh" ur qpvcpgqu"rtgi pcpe{ "kp"uwdhgtkrg"eqwr ngu0J wo "Tgr tqf"4229=44<758/7640'

xcp"fgt"XcmiO ."Dkuej qr"RJ ."Tqo klp"LC."Cengto cpu"O V."Ncpi g"LO ."Gpf gtvG"gv"cr0 Nkr qf{ utqr j{ "kp"J KX/3/r qukxg"r cvkpvu"ku"cuqekcvgf" y kj "kpuvrk"tguku wpeg"kp"o wmr rg" o gxcdqrk"r cyj y c{ u0C K U"4223=37<42; 5/43220'

xcp"Nggyw gp"G."Hgtf kpcpf "Y 0Y kv."Ulqgtf "Tgr r kpi ."Lcp"McrgnO 0GghkpeniUej cwgpnngtm"Rgygt"
Tgkuu."Hwreq"xcp"f gt"Xggp"cpf"Lcp"O 0Rtkpu0Gh hgevu"qh"cpvktgtqxktcn"y gter { "qp"ugo gp"s wcrk{ 0'
CkF U'422: =44<85968640'

xcp"Nggyw gp"G."Vgt"J T."xcp"f."X."Tgr r kpi "U." Dgklpgp" LJ "cpf"Rtkpu"LO 0Rg pgvckvqp"qh"
cvc|cpcxk"kp"ugo kpcn'r nuoc"qh'o gp"lphgevgf "y kj "j wo cp"ko o wpqf ghelgpe{ "xktwu"v|r g"30'
Cpko ketqd"Ci gpw"Ej go qvj gt"4229=73<557/5590'

xcp"Rtcci "TO."xcp"J gguy kniTR."Lxttkccpu"U. "Ncpi g"LO."J qgvgn cpu"TO"cpf"Rtkpu"LO 0'
Rgpgvckvqp"qh"y g"pweqgukf g"cpmji wg"cdcecxk"kpq"y g'i gpkcn'tcev'qh'o gp"lphgevgf "y kj "j wo cp"
ko o wpqf ghelgpe{ "xktwu"v|r g"30Enk"lphgevf ku"4223=55<g; 3/g; 40'

Xgtweej k' I N."Ecn c"N."Dkci gwk'E."Cwctf "N." Equuci rkqr" T"gv'cr0Wmtcu vtwewtcn' rixgt"
o kqej qpf tkcn'cdpqto crkkgu"kp"J KXIJ EX/eqkphgevgf "r cvkpvu"tgegkxkpi "cpvktgtqxktcn"y gter { 0L'
Ces vktgf "K o wpg"F ghelgpe{ "U{pf tqo gu"4226=57<548/54: 0'

Xkntttq{c"H'F qo kpi q'R."I kcn'O 0F twi /kpf wegf "rk qvzlek{<rk qf { utqr j { "cuuqekcygf "y kj "
J KX/3"lphgevgp"cpf"cpvktgtqxktcn'tgcv gp0*Biochim Biophys Acta*04232=3: 23<5; 465; ; 0'

Y ci pgt" I ."Tcdnk"LI ."Tcdnk" T'3; ; 70Kmpguu"uv ci g."eqpewtgpv'o gf kcvkpu." cpf"qy gt"
eqtgrcvu"qh"ny "vguvugtqpg"kp'o gp"y kj " J KX"mpguu0L"Ces vkt"K o wpg"F ghe"U{pf t"J wo "
Tgtqxktqn: 426/4290'''

Y cmgt"W."Dewgrg"L"Nci wpq"O." O wtknu"L'O cwuu"U'gv'cr0' F grgvkqp"qh'o kqej qpf tkcn'F P C"kp"
rixgt"wpf gt"cpkktgtqxktcn"y gter { "y kj "f kf cpq ukpg."ucxwf kpg"qt" crekwdkpg0J gr cvqmi { "4226=
5; <533/5390'

Y grej "M"Hkndgkpgt"Y ."Crr gtu"EG."Dnwo ghgrf "Y ."Fcxku"TN."Uo wemgt"GC."Dgemvrgf "IJ 0'
Cwqr u{ "hpf kpi u"lp"y g"ces vktgf "ko o wpg"f ghelgpe{ "u{pf tqo g0LCO C"3; : 6=474<3374/337; 0'

Y gpf kg"C0Tqddkpu."Mtkvkgp"N0Y kv."Lqugr j "M0J cugo cp."Fcxkf "D0F wpuqp."Nwki K'Vtqkcpk"
O { tqp"U0Eqj gp."EctqnF 0J co knqp."Ucmf "F 0Rgttgcvw."Dkuj etc"Nkddwu."Ucp"C0Dg{ rgt."
F qwi nu0Tcdwtp."Uj grk"V0Vgf f gt."O kej cgnF 0Uj gnd{ ."cpf "LceniD0Dkuj qr 0Cpvtgtqxktcn"
Vj gter { "Ghgevu"qp"l gpgvle"cpf "O qtr j qmi le"Gpf "Rqkpw'lp"N{ o r j qe{ vgu"cpf "Ur gto "qh'O gp"
y kj "J wo cp"K o wpqf ghelgpe{ "Xktwu"lphgevgp0Vj g"Lqwtpcn'qh"lphgevgwu" F kugcugu"4223=
3: 6<3496570'

Y J Q"("WPCkF U0I mqdcn'luwo o ct{ "qh"y g"J KXICkF U'gr kf go le*F gego dgt"4225+042260'

Y J Q0'Uecnpi "w" Tgtqxktcn"Vj gter { "lp" Tguqwt eg"Nko kgf "Ugwkpi 0Y qtrf "J gcmj "Qti cpkucvqp."
Tqo g."42250'

Y k"HY P O."Y gxgrkpi "I L"Y ggn"L"gv'cr0'kpekf gp eg"cpf "tkum'hcevqtu"ht"ugxgtg" gr cvqvzlek{ "
cuuqekcygf "y kj "cpvktgtqxktcn"y gter { 0L'kpiF ku"4224=3: 8<45/530'

Y qj nF C"cpf "Dtqy p"VV00 cpci go gpv'qh'O qtr j qmi le"Ej cpi gu"Cuuqekcygf "Y kj "Cpvtgtqxktcn"
Wug"lp"J KX/lphgevgf "Rcvkpvu0L"Ces vkt"K o wpg"F ghe"U{pf t"422: =6; *4<U; 5/U3220'

Y qpi "EJ "("Ej gpi "E[0Vj g"dmqf ovguku'dcttktg<" ku"dkqrqi { ."tgi wcvkqp"cpf "r j { ukqrqi kcn'tqrg "
kp"ur gto cvqi gpguku0Ewtgvp"Vqr keu"lp" F gxgrqr o gpvniDkqrqi { "4227=93<48564; 80'

Y qpi "GY "('Ej gpi 'E ['O'Rqmtkv\ 'r tqvklpu'cpf 'egm/eg m'lpvgtcevkqpu'lp'yj g'vguku0Kpvtgpcvkqpcn'
Tgxkgy 'qh'Egm'cpf 'O qrgewrt'Dkqmi { "422; 49: 52; 65750"

[ctej qcp'T.'Rmf c'LO . 'Vj qo cu'TX."et al.<Nqpi /vgo 'vzlek\ lcvxkv\ 'r tqhkg'qh'4ø5ø/
f kf gqz { kpqukg'lp'CKF U'qt'CKF U'tgrvgf "eqo r rgz0Lancet 3; ; 2.'558-748674; 0"

[gpk'RI . 'J co o gt'UO . 'Ectr gpvt'EE.'Eqqr gt'FC." Hkuej n'O C.'I cvgmLO "gv'cr0Cpvtgtqxkcn'
v'gcvo gpv'ht'cf wn'J KX'kphgkqp"lp"4224<wrf cvgf 'tgeqo o gpfcvkqpu"qh'yj g'Kpvtgpcvkqpcn'CKF U'
Uqelgv\ /WUC'Repgr0LCO C"4224-4: : <444/4570"

\ co dlc'F go qi tcr j le'cpf 'J gcnj "Uwtxg{ "4222642230Egptcn'Ucvkuecn'Qhleg.'Nwucn.\ co dlc."
Egptcn'Dqctf 'qh'J gcnj . 'Nwucn.\ co dlc'cpf " QTE'O cetq.'Ecrgtvqp.'O ct { rpf . 'Wpkgf 'Ucvgu=" 42250"

Hki wtg'Ngi gpf u"

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tcw'uj qy kpi 'pwo gtqwu'ugo kplhgtqwu'wdwrgu.'hwo gp"*N+y kj 'ko o qvkg'ur gto cvq| qc.'kpvgtunkwo "
*K'y kj 'dmqf "ecr kmtkgu'cpf 'egmu'q h'Ng{ f ki 0J "('G'Z'622*D+'Uej go cve"kmwutcvkqp"qh'dmqf /
vguku"dcttkt'dgy ggp"Ugtvirk'egm'*9+'cpf 'vki j v'lwpevkqp0'E+'Cp "kmwutcvkxg"hki wtg'qh'grgevtqp"
o letqi tcr j le'xkgy 'qh'yj g'ugo kplhgtqwu'gr kj grkwo 'htqo "yj g'cf wn'tcv'vguku0F gr levgf "j gtg'ctg'y q"
cf lcegpv'Ugtvirk'egmu. "dcucri'ur gto cvqi qpke"cpf "cf nwo kpcn'ur gto cvqe { vgu"cv'xctkqwu"uci gu"qh"
e{ eng0'P wergwu'qh"Ugtvirk'egm'ku'u j qy p"y kj "ur gto cvkf "go dgf f gf "cv'yj g'cr kcnle { vqr rnuo "qh"
Ugtvirk'egm0Vj g'DVD'ku'uj qy p"d { "yj g'vki j v'lwpevkqp'dgy ggp'cf lcegpv'Ugtvirk'egmu0"

Hki wtg'4<J { r qyj crco q/r kwkct { /vgulewrt'czku0"

Hki wtg'5<Uej go cve'f tcy kpi "qh'ugo kplhgtqwu'wdwrgu"*Uv+y kj "xctkqwu'f kco gygtu"*F +'cpf "
f kvcepg*t-0"

Vcdrg" 3<P TVK. "P P TVK. "RK. "Hwukp"qt"gpvt { " kþj kdkqtu" cpf "Kvgi tcu g" kþj kdkqtu" cpf "j g k" f gcku""

Drug class	Generic name	Abbreviations	Year of approval
<u>P TVK</u> "	\ kf qxwf kpg"	\ F X I C \ V"	3; : 9"
	F kf cpqu kpg"	f f n'	3; ; 3"
	\ crekcd kpg"	f f E "	3; ; 4"
	Ucxwf kpg"	f 6 V"	3; ; 6"
	Nco kxwf kpg"	5 V E "	3; ; 7"
	Cdcecxk"	C D E "	3; ; : "
<u>P P TVK</u> "	<u>P gxktcr kpg</u> "	P X R"	3; ; 8"
	F grcxktf kpg"	F N X"	3; ; 9"
	Ghcxktgp '"	G H X"	3; ; : '"
	Gtcxkt kpg"	G V T"	422: "
<u>RK</u> "	<u>Ucs w kpcxkt</u> "	U S X"	3; ; 7"
	Tkqpcxkt"	T V X"	3; ; 8"
	Kf kpcxkt"	K F X"	3; ; 8"
	P g h kpcxkt"	P H X"	3; ; 9"
	Co r t gpcxkt"	C R X"	3; ; : "
	Nqr kpcxkt"	N R X"	4222"
	Cvcl cpcxkt"	C V X"	4225"
	Hquco r t gpcxkt"	H Q U I C R X"	4225"
	Vtkr cpcxkt"	V R X"	4227"
	F ct wpcxkt"	F T X"	4228"
	Hwukp" qt"gpvt { "	Gphwtxktvg"	V/42"
	kþj kdkqtu"	O t c x k t q e"	O X E "
Kvgi tcug" kþj kdkqtu"	Tcvki tcxkt"	T C N"	4229"

Uqwtegu<F kxukp"qh' C K F U * F C K F U : " 3; ; ; =Uj cto c."42330'

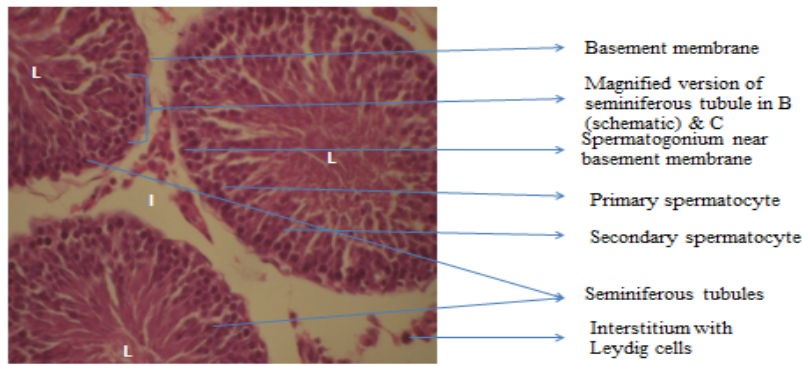
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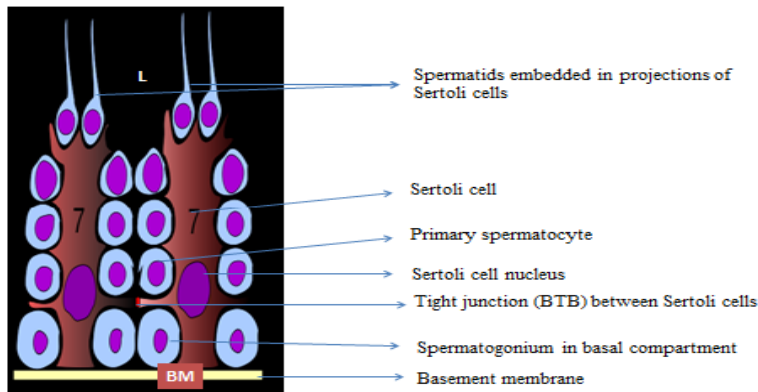
Vtgcvo gpvltwi "wugf "	Ghgewu	Fquci g"	Gzr gtlo gpvltv{r g"	F wclvqp"	Tghgtgpegu"
*P PTVK/P gxktr lpg"	F gi gpgtcvqp"qh'ugo kplhgtqwa'wdwgu." pgetquku'qh'ur gto cvkf u' " f ghqricvqp"qh' ur gto cvqe { vgu'tgf wevqp"lp'ur gto "o qvkrv{ " " xkcdkrv{ "	58'o i lni "	Cplo cn"	6'y ggm"	Cf ctco q{ g'gv'cnf)" 4233"
\ kf qnco "C\ V- 5VE+"	Tgf wegf "ur gto "o qvkrv{ " " "eqwpv{ "xkcdkrv{ ." tgf wegf "guvqugtqpg"	304; o i B22" o i "dy "	Cplo cn'	43f c{ u"	Quqpw c"gv'cnf)"4232"
\ kf qxw' lpg- " rco kxw' lpg"	Kpetgcug'lp'htgg'guvqugtqpg"	Ucpcf ctf "f qug"	J wo cp'r tqur gevkgg" tcpf qo k gf "vtcn'	9'f c{ u"	F wdg"gv'cnf)"4229"
J CCTV"	Ko r ckto gpv'lp'guvqugtqpg'gxcgu"	Ucpcf ctf "f qug"	J wo cp.'etquu" ugevqpcn'uwf { "	8'o qpj u"	I wctcnf k'gv'cnf)"4229"
J CCTV"	Ngxgu'qh'guvqugtqpg."39/gutcf kqn"39/ gutcf kqn'guvqugtqpg'cvkq."HUJ . "NJ "cpf " r tqmew'lp'y gtg'pqv'uki phtecpvt{ "f khtgvp'lp" r cvkcpw'y j q'tgr qtvgf "ugzwcnf{ "uhwpevqp0""	Ucpcf ctf "f qug"	Rtqur gevkgg'uwf { "lp" j wo cp"	6"tu" *3; ; : / 4223+"	Eqmc qu'gv'cnf)"4224"
RK/Ucs wlpcklt"	Ugo gp'cngtcvqp."f getgcugf "ur gto "o qvkrv{ " cpf "pgi cvkxgn' "ghgewu'o gej cpluo u'y cv'ctg" guvqpcn'v'q'htvkrv{ cvkqp"qh'cp"qqe{ v'g'uwej "cu" vj g'cetquqo g'tgcecvqp"	/"	Kp'xkvtq"gxkf gpeg" *Vtcln:"	/"	Cj o cf "gv'cnf)"4233"
J CCTV"	Ugo gp'cngtcvqp."tgf wevqp'lp'glcewv'g" xqno g."kpetgcugf "tcvu'qh'cdpqto cn'ur gto " o qtr j qmji { "cpf "f getgcugf "ur gto "o qvkrv{ ""	/"	Kp'xkvtq" gxkf gpeg" *Vtcln:Enplecn' gxkf gpeg*Vtcln:"	/" " " 6: "y ggm"	P leqr qwmqu'gv'cnf)" 4232d=" " xcp'Nggwy gp'gv'cnf)" 422: =" " Mgj n'gv'cnf)"42330"
P PTVKqepvclpki " " tgi lo gp'pgxktr lpg" cpf "RK" "	Cuuqekcvgf "y kj "j ki j gt'r gtegpvi g'qh" r tqi tguukxgn{ "o qvkrv'ur gto cvq qc." Xkcrv{ 0'	"/"	Etquu/ugevqpcn' uwf { "lp"j wo cp0'	Ugo gp" uco r ngu"	Nco dgtvP leqv'gv' cnf)"4233""
J CCTV"	F genlpg'lp'ur gto "eqpegpvcvqp."qvcr'eqwpv." r tqi tguukxg'o qvkrv{ "cpf "pqto cn'o qtr j qmji { "	/"	/"	/"	P leqr qwmqu'gv'cnf)" *4226+:"
J CCTV"	f getgcug'qh'vj g'tcr kf n' "r tqi tguukxg'o qvkrv" ur gto cvq qc"cpf "cp'kpetgcug'qh'guu'tcr kf n' " r tqi tguukxg'ur gto cvq qc""	/"	/"	/"	F wlkquv'gv'cn" *4224+ "
P wengqukf g/ eqpvcplpi " " cpvltgtqxkcn"	F q'pqv'lpf weg'ur gto "f co ci g'dw'o c{ " r tqf weg'lo r tqxgo gpw'lp'ugo gp's wcrv{ "	Cf o lplvgtgf " xlc" tgeqo o gpf gf " r tqvqeqni"	"Napi kwf lpcn'uwf { " qxgt"34'y ggm0"	/"	Y gpf kg'gv'cnf)"4223""
RK."PTVK'uwej "cu" \ gtlv"uncxw' lpg."f 6V+"	Nkr qf { utqr j { ""	/"	/"	"	Xkmttq{ c"gv'cnf)" 4232"
P TVK\ F X."f f K " cpf "F 6V+"	J kvqmqi kcn'gzco lpcvqp"f kur n: { gf " o cetqxgulewrt "ugcvquku."o ctngr "r gtr qtvcn' lptcj gr cvle"	/"	/"	Ugxgten' o qpj u"	[ctej qcp"gv'cnf)" 3; ; 2=" " Qmcpq"gv'cnf)"3; ; 7"

\ F X"	ej qngucuku'y kj qw'hgcwtgu'qh'o crki pcpekgu" qt 'lphgekwu'ci gpw" Cpcgo k"	"	"	"	P qvto cpu'gv'crf0" 3; ; 8"
RKk."	J { r gti n ego k"	"	"	"	J co o gt'gv'crf0"3; ; 9"
J CCTV."	f kcdggu"	/"	Rtqur gevkg'uwf lgu"	f wt lpi "6"	Dtqy p'gv'crf0"4227=
"	"	"	/"	{ gctu"	Uj cto c."42330""
RKk'gur gekm " "	j { r gti n ego k"	/"		/"	
lpf kpcxk0'					
lpf kpcxk""	Tgpcn'vzlek " "	/"	/"	/"	F lrgo cp'gv'crf0" 3; ; ; "
TVX lK X"		322t 22"o i "	DGUV"tlen'		
P TVKk"Vt k kxk IC\ V"	Cpgo k."pgwtqr gpk"ny 'y j kg'dmqf "egm'	dk' 'tgi ko gp""	"	/"	'Uj cto c."4233"
- "5VE"- "cdcecxk "+"	eqwv:"	Qpg'cdrgv" *522"o i "C\ V" - "372"o i "5VE" - "522"o i " cdcecxk+" wy leg'fckl ""			
Ego dxxk IC\ V"- "5VE"	P gwtqr gpk"ny 'y j kg'dmqf "egm'eqwv"	Qpg'cdrgv" *522"o i "C\ V" - "372"o i " 5VE+"	/"	/"	'Uj cto c."4233"
P TVKk.P P TVKk'cpf "	J gr cvqvzlek 'lpenf g'k'j gr cvku<	/"	/"	/"	'Uj cto c."4233"
RKk"	phco o cvqp'qh'vj g'ixgt. 'ke'j gr cve'pgetquk< f gcj "qh'ixgt'egm."cpf 'lke'j gr cve'ugcvquk"				

A



B



C

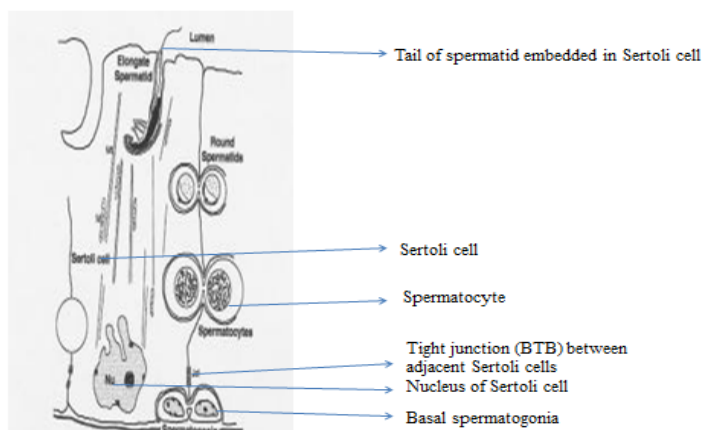


Figure 1: Histological section of the seminiferous tubules (A) Cross section of testicular tissue of rats showing numerous seminiferous tubules, lumen (L) with immotile spermatozoa, interstitium (I) with blood capillaries and cells of Leydig. H & E X 400 (B) Schematic illustration of blood-testis barrier between Sertoli cell (7) and tight junction. (C) An illustrative figure of electron micrographic view of the seminiferous epithelium from the adult rat testis. Depicted here are two adjacent Sertoli cells, basal spermatogonia and adluminal spermatocytes at various stages of cycle. Nucleus of Sertoli cell is shown with spermatid embedded at the apical cytoplasm of Sertoli cell. The BTB is shown by the tight junction between adjacent Sertoli cells.

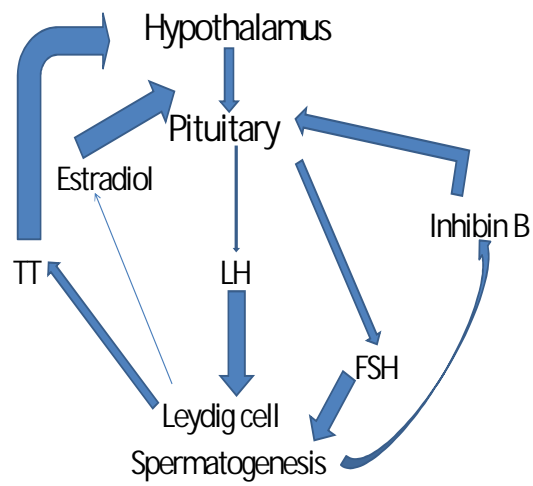


Figure 2: Hypothalamo-pituitary-testicular axis

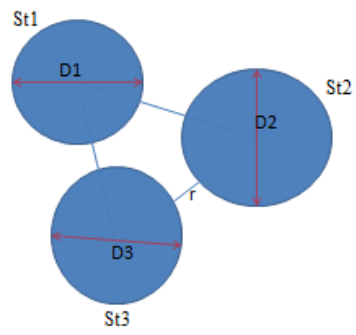


Figure 3: Schematic drawing of seminiferous tubules (St) with various diameters (D) and distance (r).